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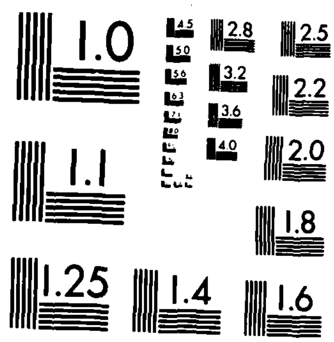
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INSTALLATION RESTORATION PROGRAM
PHASE I — RECORDS SEARCH
92nd Bombardment Wing (Heavy)
Fairchild AFB, Washington

AD-A155 041

PREPARED FOR:

Strategic Air Command
Offutt AFB, Nebraska

PREPARED BY:

JRB Associates
A Company of Science Applications International Corporation

January 1985

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Washington State

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A search of USAF, state and federal agency records and interviews with past and present base personnel and agency representatives was conducted to identify past hazardous waste generation and disposal practices at Fairchild AFB, Washington, The AFB is located 15 miles west of Spokane, Washington on a flat plateau 300 feet above the Spokane River valley. Nine off-base sites were also inspected and included training, housing, and recreation areas; a cemetary and water supply well field; and radar and other communication support facilities. Twenty-two sites were identified and inspected as potential hazardous waste sites. Numerical ranking of 12 sites was warranted based upon potential for contaminant release and environmental degradation. Petroleum storage, waste disposal and spills account for the most frequent and severe problems. Follow-on recommendations include site cleanup and closure, confirmation studies in the vicinity of past spill sites, and enhanced protection of the shallow groundwater aquifer.

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EXECUTIVE SUMMARY

The Department of Defense (DoD), as directed by Defense Environmental Quality Program Policy Memorandum 81-5 dated 11 December 1981 and implemented by Air Force message dated 21 January 1982, is taking positive actions to ensure compliance of military installations with existing environmental regulations. These actions include efforts to identify and fully evaluate suspected problems associated with past and present hazardous material disposal sites on DoD facilities, to control the migration of hazardous contamination, and to control hazards to health and welfare that resulted from these past operations.

To implement the DoD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search phase, is the identification of potential contamination sites.

JRB Associates, a company of Science Applications International Corporation, was retained by the Air Force Engineering Services Center (AFESC) to perform the Phase I Records Search at Fairchild Air Force Base and nearby off-base USAF properties under Basic Order Agreement F08637-83-G0006 5003, Solicitation F08637-84-R0032. A pre-performance meeting was conducted 14 August 1984 at Fairchild AFB in Spokane, Washington. During the five days beginning on 10 September 1984, the JRB inspection team interviewed present and retired Fairchild personnel; performed reconnaissance of on- and off-base sites; and gathered data from local, state, and federal regulatory agencies. At the conclusion of the field studies, the JRB inspection team participated in an out-briefing with Fairchild AFB staff.

Installation Description

Fairchild AFB is located 12 miles west of Spokane, Washington in Spokane County and occupies approximately 4,300 acres south of State Highway 2 (see Figure 1). This land was purchased by the Department of Defense in 1942 with donations made by the citizens of Spokane County. Fairchild AFB was named in 1950 in memory of the late General Muir S. Fairchild. Initially identified as the Spokane Army Air Depot, this base served as an aircraft retrofit and repair installation until 1947 when ownership was transferred to the Strategic

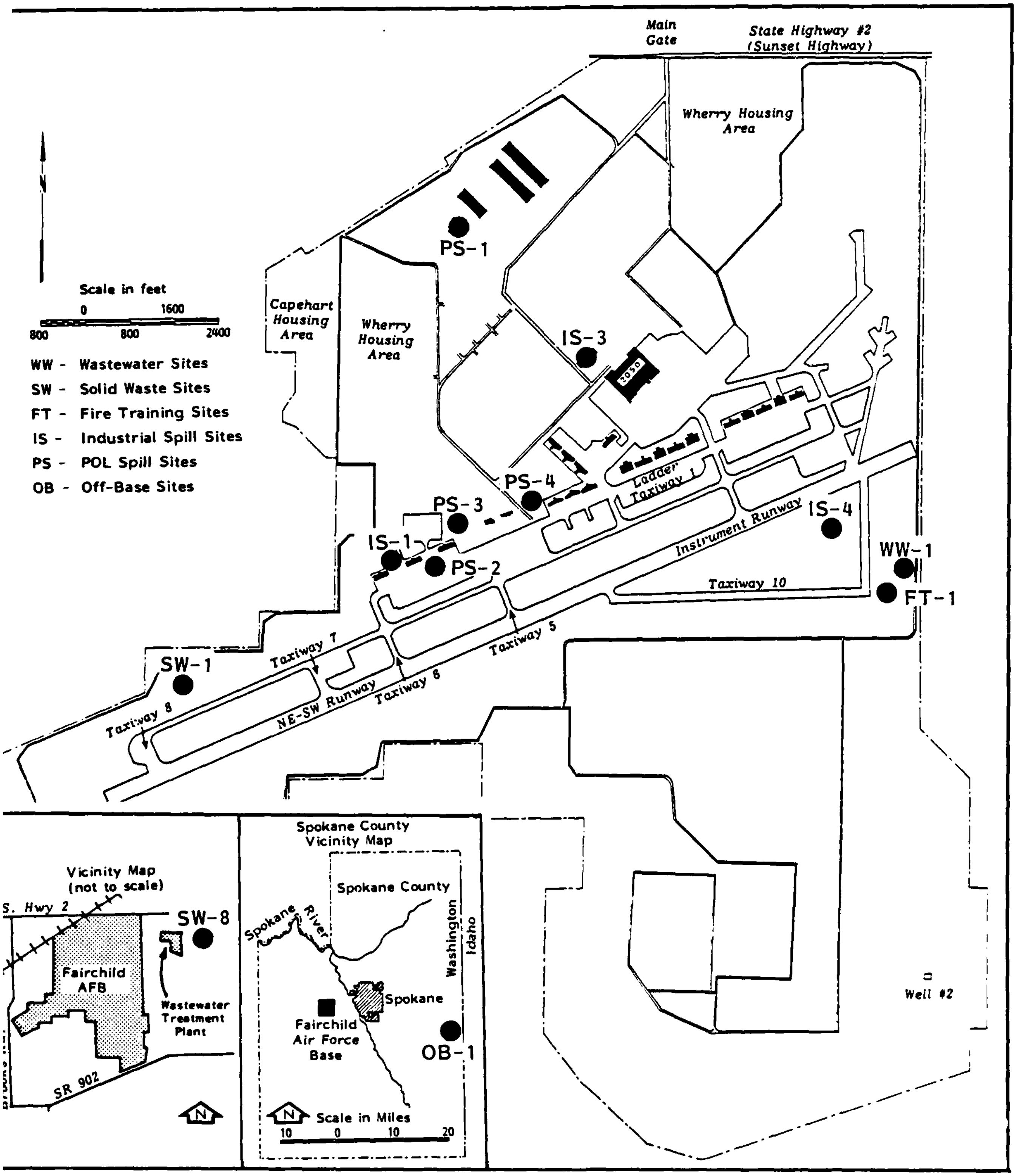

Figure 1

LOCATION OF SITES RANKED BY HARM METHODOLOGY
FAIRCHILD AIR FORCE BASE, WASHINGTON

Air Command (SAC) of the Fifteenth Air Force. The B-29 bomber was assigned to this base until 1951 when the first B-36s began arriving. In 1956 the host wing began conversions to accommodate the B-52 Stratofortress and the KC-135 Stratotanker at Fairchild. Extension and upgrading of the runway was necessary for these aircraft. The 92nd Bombardment Wing (Heavy), a SAC organization, is the host group at Fairchild AFB. Tenant organizations include the 3636th Combat Crew Training Wing, Detachment 24 of the 40th Aerospace Rescue and Recovery Squadron; 141st Air Refueling Wing, Washington Air National Guard; Detachment 1 of the 1000th Satellite Operations Group; Detachment 3 of the 9th Weather Squadron; 2039th Information Systems Squadron; and OLAA 25 ADS Mica Peak Joint Surveillance Station.

Environmental Setting

The base is situated at an elevation of 2462 feet above sea level on a plateau in the northeast corner of Washington State. Weather in the vicinity of Fairchild AFB can be characterized as temperate with hot dry summers and cold wet winters. Most of the weather which reaches the Spokane area is brought in by prevailing westerly and southwesterly circulations from the Pacific Ocean and the Gulf of Alaska. The northeast sloping plateau is west of the City of Spokane and the Spokane Valley. Drainage in the area is to the northeast to the Spokane River through shallow swales which are intermittent tributaries to Deep Creek. Soils in the area are eolian silt and sand loess deposits which are prime agricultural soils. These soils were deposited atop the Columbia River basalts which are widespread geologic units in eastern and central Washington and Oregon. The basalts are the principal groundwater reservoir of the region, although the soils also retain and transmit water. Groundwater levels in the vicinity of the base are shallow (5 to 10 feet below ground) with overlying soils composed predominantly of sands and gravels. These soils provide the groundwater only minimal protection from surface activities. Most supply wells in the area draw water from the deeper basalt aquifers. Base water is supplied by a well field at Fort George Wright which taps a glacial outwash aquifer in the Spokane Valley. This well field is located approximately 12 miles east of Fairchild AFB.

Methodology

During the course of this project, a total of 93 interviews were conducted with Fairchild personnel (past and present) or local, state, and federal regulatory agency representatives familiar with past waste disposal practices. Record searches were performed to identify past hazardous waste generation and disposal practices, and inspections were conducted at both past and present waste activity sites. Twenty-one sites located at Fairchild AFB and one off-base site were identified as potentially containing hazardous materials from past activities. Following an evaluation of the data, 12 of these sites, including the off-base site, have been assessed using the USAF's Hazard Assessment Rating Methodology (HARM), a numerical model used to rank those waste disposal sites which may be of threat to the environment or public health or safety. The HARM model takes into account such factors as site and waste characteristics, potential for contaminant mobilization and migration, and waste management practices. The remaining 10 sites are either believed not to contain hazardous wastes, or there is a very low or no potential for contaminant migration release and environmental degradation. The details of the HARM rating procedures are presented in Appendices I and J, and the priority ranking of site assessments is presented in Table 1.

Conclusions

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files, and interviews with installation personnel.

- Due to its mission involving the repair and maintenance of aircraft, the use of hazardous materials such as industrial solvents, paints, thinners, paint strippers, degreasers, and acids has been significant throughout the history base. Approximately 123,600 gallons per year of wastes are generated each r from the industrial and maintenance activities at Fairchild AFB. Appro ately 77 percent of this amount, or 95,000 gallons, are waste fuels and oi which have been and continue to be recycled. Over the years, the remair and frequently hazardous waste substances have been disposed by a varie of means including landfilling, flushing down the sanitary and storm sewer, fire training, burning in the Deep Creek AFS heat plant, contractor removal or recycling, and DPDO. Currently 21 percent, or 5,600 gallons, of all solvents used at Fairchild AFB are being recycled by a contractor or through DPDO.

2.2.2 Tenant Organizations

3636th Combat Crew Training Wing

The USAF Survival School, as it is commonly known, is Fairchild AFB's largest tenant unit. Its mission is to prepare aircrew members and those with related jobs for survival anywhere in the world under varying conditions. The 3612th Combat Crew Training Squadron conducts all basic survival training at Fairchild and prepares aircrews for more specialized training at one of the 3636th's other training schools elsewhere in the world. The 3614th Combat Crew Training Squadron provides nonparachuting water survival training.

Detachment 24, 40th Aerospace Rescue and Recovery Squadron (ARRS)

This unit's mission is to support the USAF Survival School by providing vectoring and hoist recovery training to survival school students and demonstrating the techniques and procedures used in helicopter recovery. Detachment 24 also supports the national search and rescue plan and the Military Assistance to Safety and Traffic (MAST) program. This unit also supports activities related to community health emergencies.

141st Air Refueling Wing (AREFW), Washington Air National Guard

The Air Guard refueling missions are flown under the direction of SAC in keeping with the Air Force's "single manager" concept for refueling operations. Fairchild-based units include the 116th Air Refueling Squadron, 105th Tactical Control Squadron, 141st Maintenance, resource and management and support squadrons, communications, security police, civil engineering, weather flights, and the 560th Air Force Band. The 141st AREFW provides logistic support to nine other units located elsewhere in the State of Washington.

Detachment 1, 1000th Satellite Operations Group

This organization performs the command and control of orbital spacecraft assigned to the Defense Meteorological Satellite Program (DMSP). The DMSP spacecraft collect visual and infrared data of the earth and transmit this information back to the detachment's 40-foot antenna tracking system. The information is relayed via a communications satellite link to Air Force Global

operations building and aircraft wing hangars; chapel, hospital, swimming pool, and theater; and all-weather aircraft shelters, hangars, additional POL facilities, and expansion of the primary instrument runway to 300 feet wide by 13,620 feet long.

The first B-36 aircraft arrived at Fairchild in 1951. At about the same time, the 111th Reconnaissance Wing (Air National Guard) was activated to fly the giant RB-36 reconnaissance aircraft. This unit was later redesignated the 99th Bombardment Wing and transferred to Westover AFB. In 1953 the Air Depot facility was deactivated, and by 1956 the wing had begun a conversion that brought the B-52 Stratofortress and the KC-135 Stratotanker to Fairchild in 1958. In 1960-1961 Fairchild AFB underwent extensive repairs which included a new narrow gauge concrete keel and centerline lighting for the primary instrument runway; Taxiways 1 through 4, part of 6, and new narrow guage concrete inlay for the Ladder Taxiway; a new liquid oxygen plant; and a new missile assembly building. In 1961, Fairchild's 92nd Bombardment Wing (BMW) became the first aerospace wing in the nation with the acquisition of the Atlas Intercontinental Ballistic Missile. With the new role and upon addition of the missiles, the 92nd BMW became the 92nd Strategic Aerospace Wing. However, the missiles did not stay at Fairchild long; the last of these missiles were removed in late 1965. On March 1, 1966 the 3636th Combat Crew Training Group, later to become a wing, was activated at Fairchild. The group eventually assumed responsibility for all Air Force survival and special training.

In 1964 the Strategic Air Command began air refueling operations over Southeast Asia and a tanker from the 92nd BMW flew its first refueling mission over Vietnam that year. By 1966 the B-52 had entered the Vietnam conflict and the 92nd BMW's bombers and tankers participated in that conflict until a general cease fire went into effect in January 1973.

The 92nd Bombardment Wing (Heavy) continues as the host unit at Fairchild. The base mission has been and continues as a Strategic Air Command (SAC) installation which employs a mixed force of B-52 Stratofortresses and KC-135 Stratotankers. SAC's mission is to maintain a force instantly ready to conduct strategic air warfare and operations on a worldwide basis.

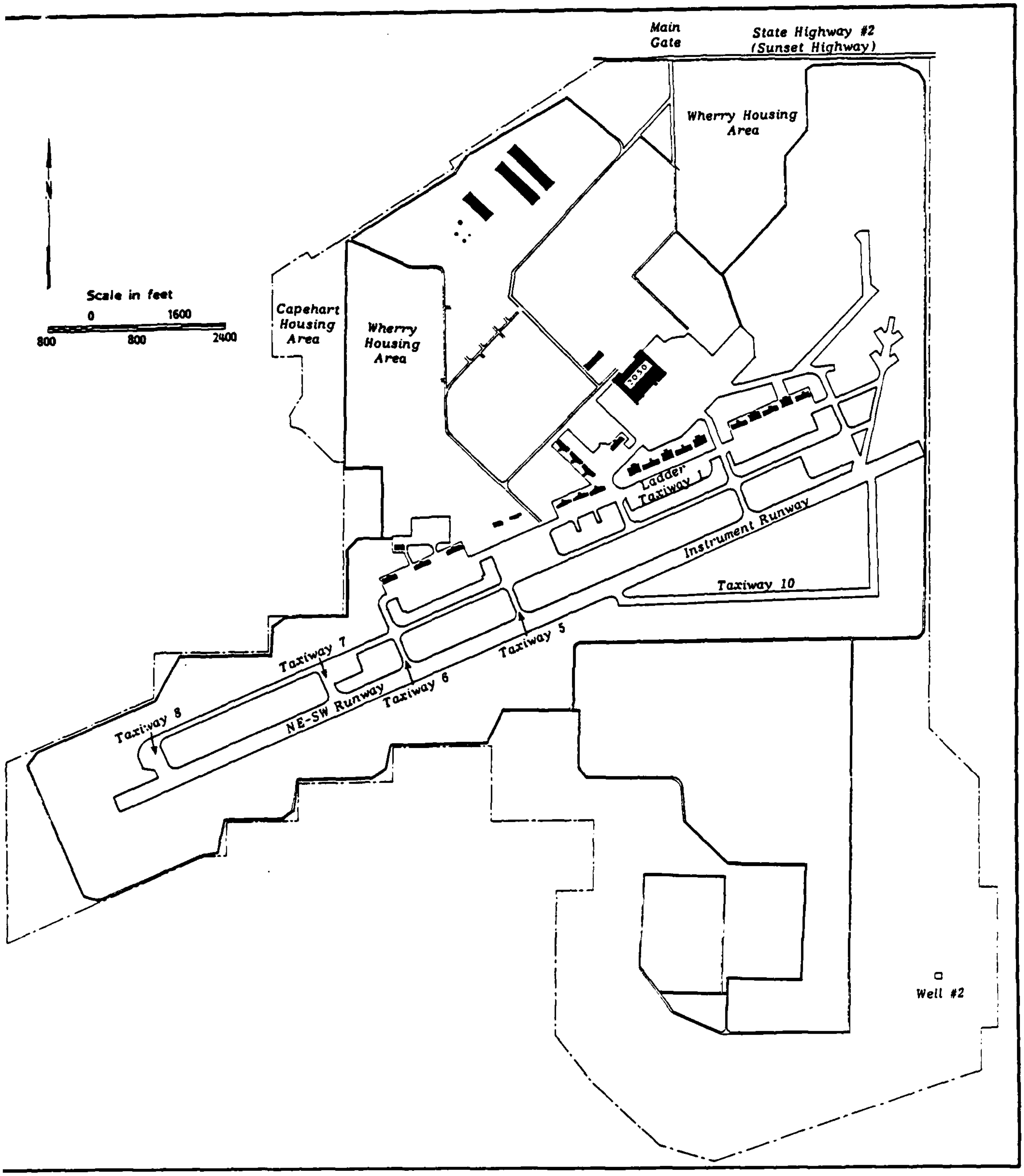

Figure 2.2

MAJOR AIRFIELD FACILITIES
FAIRCHILD AIR FORCE BASE, WASHINGTON

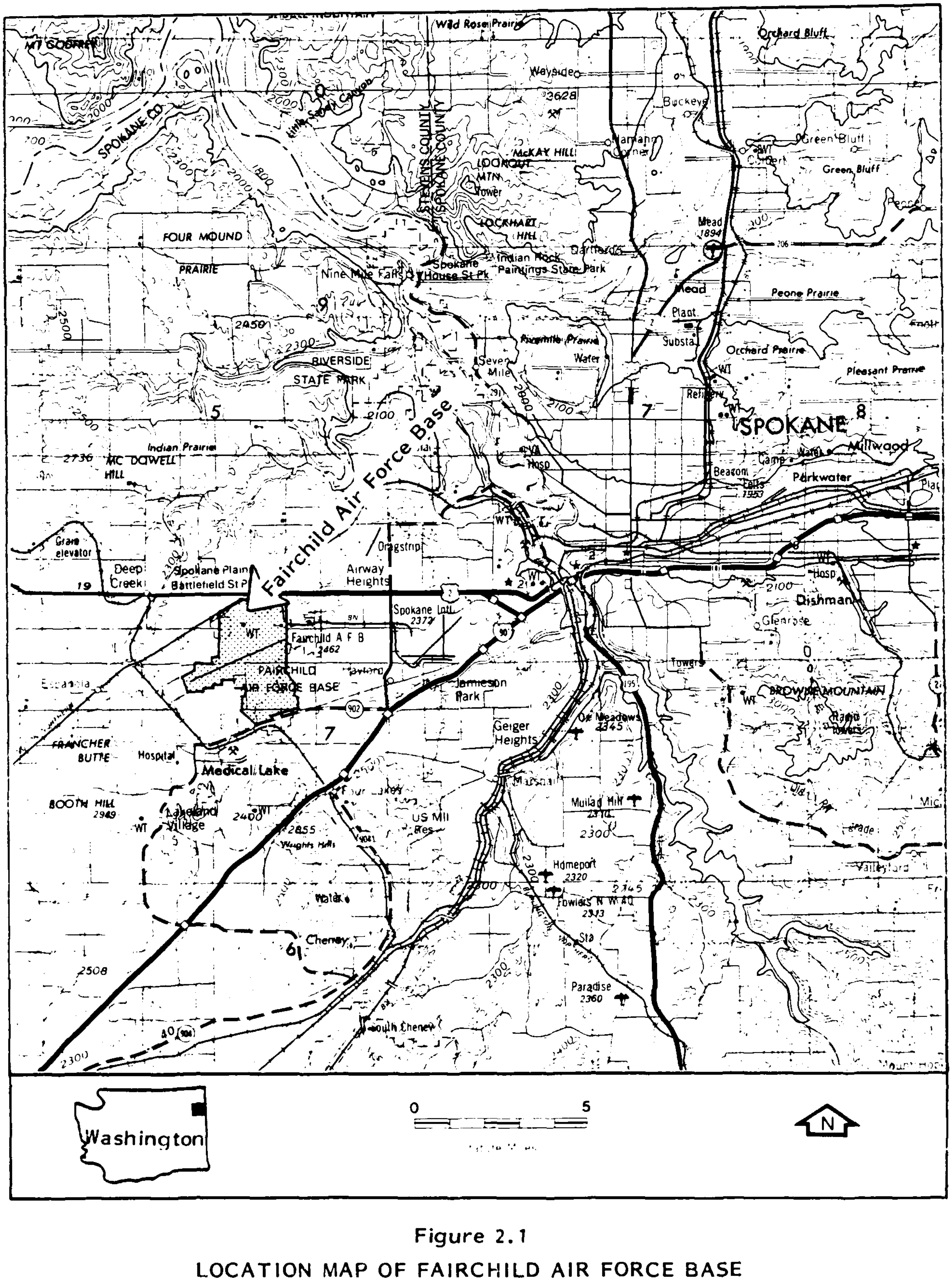

Figure 2.1

LOCATION MAP OF FAIRCHILD AIR FORCE BASE AND SPOKANE, WASHINGTON

2.0 INSTALLATION DESCRIPTION

2.1 LOCATION

Fairchild Air Force Base is located 12 miles west of Spokane, Washington (T24N, R41E, Sec. 4, 5, 6 and T25N, R41E, Sec. 27, 28, 32, 33) and occupies approximately 4,300 acres (Figure 2.1). Figure 2.2 is an illustration of the base showing airfield layout and major facilities. The land on which the base is located is a relatively flat northeast sloping plateau at the northeast margin of the Columbia Basin.

Major access roads to Fairchild AFB include Interstate Highway 90 (I-90) and U.S. Highway 2. I-90 is located approximately two miles from the south and east boundaries of the base and intersects U.S. Highway 2 approximately seven miles to the east. U.S. Highway 2 parallels the base's north boundary. Main gate access to the base is off of U.S. Highway 2. U.S. Highways 375 and 195 intersect U.S. 2 nine miles east of the base. State Highway 902 bounds the south portion of the base, and connects with U.S. 2 via Brooks Road to the west.

2.2 MISSION AND ORGANIZATION

2.2.1 Host Group, 92nd Bombardment Wing (Heavy)

Fairchild AFB has been an important part of Eastern Washington's Inland Empire since Spokane County citizens donated over $100,000 to the War Department in 1942 for the purchase of the land on which the base is located. Construction of the Spokane Army Air Depot began in March 1942, and the base served as a repair depot until 1946. In 1947 Spokane Army Air Depot was transferred to the Strategic Air Command and assigned to the Fifteenth Air Force. Units assigned to the base were flying the B-29, the advanced bomber of that era. The base took its present name in November 1950, in memory of the late General Muir S. Fairchild. In 1950-1951 a new primary instrument runway 200 feet wide by 10,300 feet in length with supporting taxiway and POL facilities was constructed. Subsequently, base expansion activities included the construction of the following new facilities: new airmen dormitories, dining hall, and officer and NCO family housing (Wherry and Capehart housing areas); base

nearest surface water and groundwater supplies, population within 1,000 feet of the site, and waste management practices. Appendix I provides additional rationale and history of HARM methodology. A scoring form for each site rated at Fairchild AFB is provided in Appendix J.

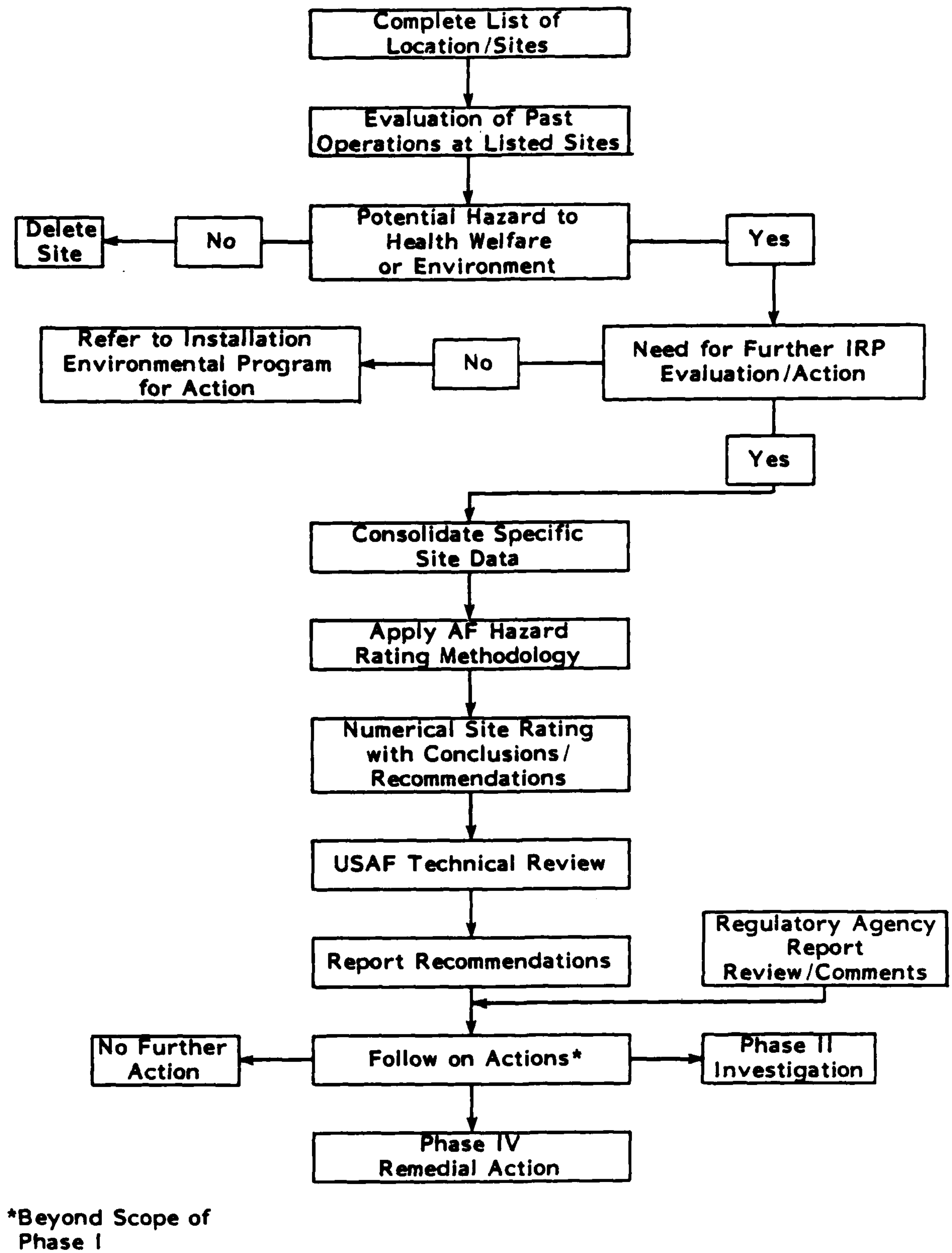

Figure 1.1

PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOW CHART

1.4 METHODOLOGY

The procedures and methodology of the Phase I records search are defined by the USAF and depicted schematically in Figure 1.1. A review of past and present industrial operations was obtained through available shop files, real property files, interviews with past and present employees, off-base contractors, and historical records, photographs and maps.

Next a review of the past and present management practices for landfill areas, dump sites, hazardous wastes, and accidental spills was considered. The identification of landfill and other solid or liquid waste disposal and burial sites, solvent and fuel storage and disposal sites, and spills and leaks was the goal of this management protocol.

Once potential sites had been identified and inventoried by records search or verbal contact with personnel, a ground survey of specific sites was undertaken to observe obvious signs, if any, of environmental stress (leachate, dead or stunted vegetation, etc.) on the installation. In addition to the inventoried sites, the general ground and aerial tours provided access to additional sites. All identified and surveyed sites were catalogued and designated on maps. Geomorphology, drainage, soil condition, hydrology, local meteorology and geology were carefully considered at each site. This helped to identify and rank by priority the potential for hazardous waste problems at each site.

A numerical ranking of risk was performed at those sites where an activity fostered disposal pracitces that produced documented or strongly suspected contamination from hazardous substances. To assist in determining the relative degree of risk, the USAF developed a tool called the Hazard Assessment Rating Methodology (HARM). The HARM methodology utilizes a numerical model that, when applied to sites with suspected contamination from a hazardous substance, provides a score which may be used for comparison and relative ranking between two or more sites. The resultant HARM scores assist the USAF in determining the priority and necessity for additional site investigation or remedial action based on the potential for environmental contamination and migration. The numerical HARM score is determined by several factors, including the types and quantities of wastes, environmental and site conditions, distance to

(AFESC) under Basic Order Agreement F08637-83-G-0006 the task to perform the IRP Phase I Records Search at Fairchild Air Force Base (AFB). This IRP Phase I Records Search was directed and performed by JRB Associates' staff located in Bellevue, Washington. Resumes of key project personnel are included in Appendix A.

On 14 August 1984, a pre-performance meeting was conducted at the Civil Engineering Headquarters at Fairchild AFB in Spokane, Washington. This meeting served as a general orientation to the IRP contractor and United States Air Force (USAF) personnel. Representatives from JRB Associates, AFESC, and the Strategic Air Command (SAC) were present. A number of documents specific to SAC activities and Fairchild AFB in particular were provided to JRB Associates during the course of this meeting.

Technical performance of the IRP Phase I at Fairchild AFB began 10 September 1984. This was accomplished with five days of on-site interviews of past and present USAF personnel and field reconnaissance of Fairchild AFB and other off-base properties. The JRB investigative team participated in an outbriefing with Fairchild AFB staff.

The records search team interviewed 11 representatives from outside agencies (Appendix B) and 82 individuals (Appendix C) who have served at Fairchild AFB or who had knowledge of the operation and mission of the USAF base. During the visit to Fairchild AFB, the records search team was able to interview personnel from over 70 shops, branches, or tenants (Appendix E). In addition, an extensive ground tour was made of the base facilities, and helicopter overflights were provided of Fairchild AFB and all off-base properties.

Key individuals from the USAF who participated in the Fairchild AFB Installation Restoration Program included:

92nd CSG/DED, Deputy Civil Engineer
92nd CSG/DEEV, Chief Environmental Planner
92nd HOSP/SGPB, Chief Bioenvironmental Engineer
92nd BMW/PA, Chief of Public Affairs
HQ SAC/DEPV, Environmental Engineer

Phase III - Technical Base Development - This phase is the responsibility of the USAF's Engineering and Services Center and its purpose is to develop a sound data base upon which to prepare a comprehensive remedial action plan. This phase includes implementation of research requirements and technology for objective assessment of adverse effects. A Phase III requirement can be identified at any time during the program.

Phase IV - Operations/Remedial Actions - This phase is the responsibility of the USAF's Engineering and Services Center and includes the preparation and implementation of the remedial action plan.

1.2 PURPOSE

The purpose of IRP Phase I is to identify and fully evaluate suspected environmental problems with past hazardous material disposal or spill sites on DoD facilities, to check the migration of hazardous contamination and to minimize risks to health or welfare that result from those past practices. Phase I of the IRP consists of a records research, personal interviews, site investigations, and follow-on recommendations. State and federal agencies, libraries and other reference sources on base and off base have been contacted. No new field or experimental data have been collected other than that gained through the on-site field survey and assessment. The primary target of this study was to compile an installation inventory of: (1) What hazardous materials have been on the installation since its commission? (2) What has been the ultimate disposition of these materials, either as product use or subsequent storage, treatment or disposal? (3) What potential exists for release and migration of these materials? and (4) What potential exists for health and environmental damage?

Research of the records included the acquisition of supporting documents on the installation history, geology, hydrology, meteorology, environmental/ecological setting, and previously performed aerial and photo reconnaissance surveys. Interviews with present and past personnel familiar with waste disposal practices resulted in a ground survey and subsequent evaluation of 12 sites according to the USAF Hazardous Assessment Rating Method (HARM).

1.3 SCOPE

On 30 April 1984 JRB Associates, a Company of Science Applications International Corporation, was awarded by the Air Force Engineering Services Center

1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Air Force, in part due to its primary mission in defense of the United States, is engaged in a wide variety of operations dealing with toxic and hazardous materials. This problem has been recognized by the Department of Defense (DoD) and action has been taken to identify the locations and contents of past disposal sites, and to eliminate the hazards to public health in an environmentally responsible manner. The DoD program is called the Installation Restoration Program (IRP). The IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981, and implemented by Air Force message 211807Z Jan 82. The IRP is defined in DEQPPM 81-5 as a four-phased program that is designed to assure that identification, confirmation/quantification, and remedial actions are performed in a timely and cost-effective manner. The initial IRP guidance was developed and published in June 1982. This document included in-depth guidance for Phase I, concept guidance for Phase II, and general guidance for Phases III and IV. The management concept for Phase II has been developed by the Air Force Medical Service Center (AFMSC) in May 1982. Each phase, briefly described, and its relationship to the overall program is:

<u>Phase I - Installation's Assessment (Records Search)</u> - Phase I is the responsibility of the USAF's Engineering and Services Center. Its purpose is to identify and rank by degree of concern those past disposal sites that may pose a hazard to public health or the environment as a result of contaminant migration to surface or ground waters, or have an adverse effect by its persistence in the environment. In this phase, it is determined whether a site requires further action to confirm an environmental hazard or whether it may be considered to present no hazard at this time. If a site requires immediate remedial action, such as removal of abandoned drums, the action can proceed directly to Phase IV. Phase I is a background document for the Phase II study.

<u>Phase II - Confirmation/Quantification</u> - Phase II is the responsibility of the USAF's Occupational and Environmental Health Laboratory (OEHL) and is to define and quantify, by preliminary and comprehensive environmental and/or ecological survey, the presence or absence of contamination, the extent of contamination, waste characterization (when required by the regulatory agency), and identify sites or locations where remedial action is required in Phase IV. Research requirements identified during this phase will be directed to AFESC for inclusion in the Phase III effort of the program. Needs for contaminant health standards will be identified to the Command Surgeon for resolution.

Table 2

SUMMARY OF RECOMMENDATIONS

Site ID	Site Description	General Recommendations	Sample Analysis	Land Use Restrictions
WW-1	Industrial Waste Lagoons	Inspect liners, replace if necessary. Drain and remove solids at regular intervals.	Sludge analyzed for heavy metals, pesticides, chlorinated hydrocarbons.	Restricted to current use.
FT-1	Fire Training Area	Pressure test the waste JP-4 tank. Extend clay liner around/underneath the waste JP-4 tank. Keep the light fraction wastes pumped out of the oil/water separator to prevent escapement.	Four to six shallow monitoring wells. Groundwater analysis should include aromatic hydrocarbons, heavy metals, pH, and conductance.	Restricted to current use. Prohibit water supply wells and infiltration areas, recreational use and agricultural use.
SW-1	Base Landfill NE of Taxiway #8	Initiate monitoring program.	TOX, TOC, pH, heavy metals, specific conductance. Four groundwater wells, six to eight groundwater sampling events over one to two years.	Restricted by the runway and clear space.
PS-3	Area C - Pumphouse Fueling	Improve fuel handling to avoid spillage. Initiate monitoring program. Consider soils treatment or removal.	Ten shallow borings analyzed for possible aromatic hydrocarbons, heavy metals; shallow monitoring wells.	Restricted to current use.
SW-8	Base Landfill at Craig Road	Cover and grade construction and demolition waste. Initiate monitoring program.	TOX, TOC, pH, heavy metals, specific conductance. Five groundwater wells, six to eight groundwater sampling events over one to two years.	Restricted to recreational opportunities and limited traffic. Prohibit wells, deep excavations, agricultural and silviculture, building of structures, and water infiltration.
PS-4	Pumphouse B	Environmental monitoring, removal or in-situ treatment of contaminated soils, if necessary.	Three monitoring wells. Soil and groundwater analysis for aromatic hydrocarbons and heavy metals.	Restricted by location within the industrial area.
OB-1	OLAA 25 ADS Mica Peak JSS	Monitor soil and water supply for PCB contamination, remove soils, if necessary.	Six soil borings and 12 PCB analyses in soil matrix. Three water samples from potable water supply over a one-year period.	Restricted to current use. No burning or ignition of sources.
PS-2	Refueling Pits #18 and #19	Improve fuel handling to avoid spillage. Initiate monitoring program. Consider soils treatment or removal.	Three groundwater wells and Civil Engineering borings should be analyzed for aromatic hydrocarbons, specific conductance, and heavy metals, six sampling events over two years.	Restricted to current use. No burning or ignition of sources.
PS-1	POL Bulk Storage Tanks	Monitor soils underneath berms. Continue with plans to spray berms with gunite. Empty tanks and inspect thoroughly, repair if necessary. Dispose of fuel tank sludges in accordance with USAF procedure AFM 85-16.	Four monitoring wells. Soil and groundwater analysis for aromatic hydrocarbons and heavy metals.	Restricted to current use.
IS-1	Building 1034 French Drain	Remove french drain and install a sump pump to lift wastewater to the sanitary sewer.	Two monitoring wells. Groundwater analysis for pH, conductance, TOX and TOC.	Restricted to current use.
IS-4	Jet Engine Test Cell	Improve waste materials handling. Install an oil/water separator.	None	Restricted to current use.
IS-3	Building 2150, Reciprocating Engine Test Cell	Reinspect to locate all underground fuel lines and tanks. Clean up facility, label and properly store all chemical substances.	Four to six shallow monitoring wells. Soil and groundwater analysis for armoatic hydrocarbons and heavy metals.	Restricted to current use.
N/A	Low-Level Rad Waste Site Near Treatment Plant	Fence the site and mark it with an appropriate sign.	None	Restricted to recreational use and limited traffit. Prohibit excavations, wells, agriculture, silviculture, building of structures.
N/A	Oil/Water Separators	Perform dye test to determine to which collection system each separator discharges. Locate each separator on the appropriate as-built drawings.	N/A	Restricted to current use.

- Numerous solid waste disposal sites, including two landfills, have been documented. The two base landfills reportedly received waste solvents, paints, thinners, and paint strippers over the course of their operation. The potential for environmental contamination exists at these sites due to shallow groundwater and permeable overlying soils.

- Fuel spills have been associated with the POL storage and distribution system. Aircraft accidents and spills on or near the flightline from fueling and defueling operations have resulted in some major releases of fuel to the environment. The early history of POL spills is relatively unknown since spills have only been documented since 1974.

- Twenty-one waste disposal sites at Fairchild AFB and one off-base site located at Mica Peak were identified as having a potential to cause environmental contamination. After assessment of waste characteristics, environmental conditions, and contaminant migration potential, 12 of these sites were selected for numerical scoring using the Air Force Hazard Assessment Rating Methodology (HARM). These sites and their corresponding HARM scores are presented in Table 1. The remaining 10 sites were determined to have low or no potential environmental risk.

Recommendations

The detailed recommendations for further assessment of potential environmental contamination are presented in Chapter 7.0. Several of the recommendations call for environmental monitoring to determine the presence or absence of environmental contamination. Additional recommendations concern the implementation of "Best Management Practices." Specific recommendations are summarized in Table 2.

Table 1

PRIORITY HARM RANKING OF DISPOSAL SITES
FAIRCHILD AIR FORCE BASE, WASHINGTON

Site Number	Site Name	HARM Score
WW-1	Industrial Waste Lagoons	71
FT-1	Fire Training Area	70
SW-1	Base Landfill NE of Taxiway #8	64
PS-3	Area C - Pumphouse Fueling	64
SW-8	Base Landfill at Craig Road	63
PS-4	Pumphouse B	61
OB-1	OLAA 25 ADS Mica Peak JSS	60
PS-2	Refueling Pits #18 and #19	59
PS-1	POL Bulk Storage Tanks	53
IS-1	Building 1034 French Drain	52
IS-4	Jet Engine Test Cell	47
IS-3	Building 2150, Reciprocating Engine Test Cell	40

Weather Control at Offutt AFB, Nebraska, where it is processed into meteorological and aerospace environmental data to support Department of Defense agencies and military operations on a world-wide basis.

Detachment 3, 9th Weather Squadron

This detachment provides weather support to the 92nd Bombardment Wing and to all other DoD units located at Fairchild in the form of weather forecasts and observations. In addition to these functions, this organization operates the Cold Fog Dispersal System during the winter months at Fairchild in order to permit 92nd BMW and transient flying operations on days when fog would ordinarily prevent these activities.

2039th Information Systems Squadron

This squadron is part of the Air Force Information Systems Command which has worldwide responsibility for operating and maintaining communication systems and air traffic control services. It directly supports the flying mission of the 92nd Bombardment Wing at Fairchild and provides collateral support to other base units. This unit also operates the base telecommunications center and manages the base telephone system through contracts with Pacific Northwest Bell.

Other Units

Additional tenants of Fairchild AFB include the Air Force Audit Agency, the Defense Property Disposal Office, 3904 Detachment 2001 Office of Special Investigations, Federal Aviation Administration, USAF Postal Service Center, and the 823rd Radar Squadron.

2.3 BASE SERVICES

2.3.1 Population

Fairchild AFB employs approximately 4,400 military and 800 civilian personnel. There are approximately 7,000 retired service personnel in the Spokane region.

2.3.2 Housing

Military housing is available to all active military personnel and includes base dormitories and 1,580 housing units. Of these apartment units, 958 are Wherry units which were constructed in 1952; 541 are Capehart units constructed in 1959-1960; and 81 appropriated quarters were built in 1957. Of this total, 319 of these homes are located off-base at four locations: Geiger Heights Housing Area, Spokane International Airport, Spokane Family Housing Annex, and Cheney.

2.3.3 Schools

Blair Elementary School is located on the base and provides kindergarten through sixth grade schooling for children of base personnel. Junior and senior high school age youth living on base may attend schools at Medical Lake, a small community approximately seven miles from the base.

2.3.4 Medical Facilities

The Fairchild Composite Medical Facility is comprised of the base hospital, dental service, aeromedical services and physiological training service. The hospital is a modern 55-bed medical facility.

2.3.5 Wastewater Treatment Plant

The base is served by an extensive sanitary collection system and treatment plant. The bio-filtration plant accomplishes primary and secondary treatment of sewage. This plant consists of a grit chamber, bar screen and comminutors, clarifiers, trickling filters, anaerobic sludge digesters, and sludge drying bed. Treated wastewater is discharged into non-overflow exfiltration lagoons.

2.3.6 Water Supply

All water for Fairchild AFB is obtained from wells. A well field consisting of three active wells is located in the former Fort George Wright area, approximately eight miles northeast of the base. A fourth well is located at the Fairchild Water System Annex No. 2, approximately 1.3 miles south of the base, near the Weapon Storage Area. The well field at Fort George Wright draws

water from the Spokane Valley-Rathdrum Prairie aquifer, a designated sole-source aquifer for the Spokane area. The yield of the well field and the capacity of the distribution system are approximately 5,300 gpm. However, dynamic head losses in the system limits the supply to 4,300 gpm. The potable water supply is delivered to the primary storage facility, known as the Geiger Reservoir, a 480,000-gallon capacity concrete storage tank. Here the water is chlorinated prior to being distributed to the Geiger Field and Fairchild storage facilities. On-base water storage facilities consist of two 500,000-gallon concrete tanks, two 75,000-gallon high tower concrete tanks, and two 150,000-gallon elevated steel tanks. The distribution lines are constructed of 12-inch steel or cast iron pipe. Lateral service lines are usually six or eight-inch pipe. Water is chlorinated at the Geiger Reservoir, and then rechlorinated and fluoridated prior to storage in the high tower storage tanks. The Fairchild pump station delivers water to the high tower storage tanks with two 2,000 gpm pumps. The water quality of the Fairchild supply is within acceptable drinking water standards for the State of Washington as regulated by the Department of Social and Health Services. Laboratory analyses are performed routinely to monitor groundwater quality. Bacteriological analyses are performed eight times per month by the state laboratories, while organic, inorganic, and radiological water quality parameters are analyzed by OEHL. Appendix D contains supplemental potable water quality data.

2.3.7 Social and Recreational Facilities

In addition to off-base activities, military personnel can utilize a wide variety of on-base social and recreational facilities including: gymnasium, bowling center, child care center, youth center, library, swimming pool, auto crafts center, roller skating rink, arts and crafts center, wood crafts center, after hours pub, Deel Recreation Center, and Officer and NCO Open Mess halls.

3.0 ENVIRONMENTAL SETTING

3.1 METEOROLOGY

The climate of the Spokane area combines some of the characteristics of damp coastal-type weather and arid interior conditions. Most of the air masses which reach the Spokane area are brought in by prevailing westerly and southwesterly circulations. Much of the moisture in the storms that move southeastward from the Gulf of Alaska or inland from the Pacific Ocean is precipitated out as the storms are lifted across the Coast and Cascade Ranges. The air masses drop in elevation, and as they warm result in low humidity, low precipitation, and high evaporation potential as they move eastward across the desert areas of central Washington. However, the lifting action on the air masses as they move up the east slope of the Columbia Basin frequently produces the cooling and condensation necessary for formation of clouds and precipitation. As a consequence, the average annual precipitation for Fairchild AFB is 17.2 inches, less than half that of western Washington, but half again or more than that of the central desert. Approximately 70 percent of the total annual precipitation falls as snow. The average maximum relative humidity is 77 percent, while the average minimum relative humidity is 49 percent. The National Oceanic and Atmospheric Administration reports that the estimated evapotranspiration for Fairchild AFB is 12.8 inches, resulting in a net annual precipitation of 4.4 inches.

The Fairchild area frequently comes under the influence of dry continental air masses from the north or east. On those occasions when the air masses penetrate into eastern Washington, the result is very low humidity with high temperatures in the summer and sub-zero temperatures in the winter. In the winter, most of the very severe arctic outbursts of cold air move southward on the east side of the Continental Divide and do not affect eastern Washington (U.S. Weather Bureau).

In general, the climate in the Fairchild area has the characteristics of a mild, arid region in the summer and a cold coastal region in the winter. A record high temperature of 108°F was recorded in July 1928, while the record low of -30°F occurred in January 1888. Mean daily maximum temperatures range

from 31.4°F in January to 83.6°F in July, and mean daily minimum temperatures range from 19.2°F in January to 55.4°F in July. The annual mean maximum for the period of 1931-1960 is 57.5°F, and annual mean minimum for the same period is 37.2°F. The mean wind velocity is 8.1 mph, and the prevailing wind is from the southwest. Appendix D contains supplemental environmental data including a climatological summary for the Spokane area.

3.2 PHYSICAL GEOGRAPHY

Fairchild AFB lies at an elevation of 2,462 feet above sea level on the northeast margin of the Columbia Basin physiographic province of Washington State. This region is a topographic basin which is completely surrounded by mountains: the Okanogan Highlands to the north, the Rocky Mountains to the east, the Blue Mountains to the south, and the Cascades Mountains to the west (McKee, 1972). The principal drainage course in the basin is the Columbia River. Many tributary rivers carry water from the surrounding ranges into the interior lowlands. The Columbia River flows west along the northern edge of the basin. It then turns and flows south and east away from the Cascades before turning west again towards the Pacific Ocean.

The base is located on a relatively flat plain which slopes gently to the northeast. The landscape of the base and local surrounding areas is typically agricultural with grasses covering the rolling Palouse Hills. Few regions of North America produce crop yields which surpass those harvested in eastern Washington. Wind-blown dust called loess covers large parts of eastern Washington, and this soil represents some of the most fertile soils anywhere.

The Spokane Valley lies to the east of the Columbia Basin and Fairchild AFB. The valley includes the lowland plain along the Spokane River east of Spokane to approximately the Washington-Idaho border 20 miles away. West of Spokane the lowland river plain abuts sharply against the plateau of the Columbia Basin which rises 300 to 400 feet above the Spokane Valley.

3.3 GEOLOGY

The Columbia Basin physiographic province of Washington State is the result of volcanic activity in the southeast and northeast corners of present-day

Washington and Oregon, respectively. Volcanoes flooded much of central and eastern Washington with basalt lava flows from the Ancient Grande Ronde volcano--named for the excellent exposures of basalt dikes which are exposed in the canyon of the Grande Ronde River—on the border between Washington and Oregon (Alt et al., 1984).

Basalt is a hard, dark colored rock composed primarily of iron and magnesium minerals. There are many different varieties of basalt, and the Columbia Basin is covered with layers of basalt from several different eruptions. Each layer is unique, but for the purpose of simplicity, all the basalts that underlie the plateaus of the Columbia Basin region are known as Columbia River flood basalt.

The flood basalts of the region were probably fed from more than one fissure or vent which erupted simultaneously. To cover the large areas which are blanketed with continuous basalt units, the flows are believed to have spread like water for great distances. This fluidity is suggested by the even tops of the flows and the fact that they are traceable for 10 miles or more without significant changes in thickness (McKee, 1972). It is believed that the first flows of the Columbia River basalt were erupted onto a landscape of rolling hills, and gradually the lava from successive eruptions filled in the lowlands of the Columbia Basin. Geologic units which are older than the basalts lie completely concealed by basalt at the center of the province. However, these units are exposed around the basin margins.

After the flood basalts, the continental ice sheets, the glacial meltwaters, and glacially diverted rivers modified the landscape to its present contour. The preglacial topography along the northern edge of the plateau was probably not too different from that of today. Glaciers moving southward encountered the high basaltic rim of the plateau along the east-west segment of the Columbia River (McKee, 1972). The Spokane Valley and contiguous plains are underlain by loosely packed, poorly sorted gravel and sand as thick as 500 feet in many places. These deposits were laid down as outwash from glaciers that once occupied this area. A large part of the glacial outwash beneath the Spokane Valley is composed of cobbles and pebbles which provide it with a very high porosity and permeability. This permeability is evidenced by the large

specific yields of wells which tap the outwash aquifer, commonly 1,000 gallons or more per minute for each foot of draw-down (Piper et al., 1944).

The rich soils of eastern Washington's Palouse Country (a name derived from one of its few prominent rivers) are possibly a product of the Pleistocene (0-2 million years before present) glaciation. The Palouse soil is not a residual soil such as those which are derived from the weathering of the underlying bedrock. It is loess, or wind-deposited silt. Loess deposits commonly form downwind from glaciated regions as large clouds of dust blow off glacial outwash deposits during dry seasons. Dust storms also blow out of deserts, and loess deposits commonly form downwind from them. It is believed that the origins of these soils are from glacial or desert areas, although the precise origins of the Palouse loess deposits are unknown. The Palouse region is immediately south of glaciated regions and immediately northeast of the extremely dry country in south-central Washington and northern Oregon.

3.4 HYDROLOGY AND WATER USE

Basalt bedrock beneath Fairchild AFB is generally covered by soil to a depth of 10 to 20 feet below ground surface. Basalt outcrops occur on the base. The soils underlying the base are primarily silts and sands with some gravels and clays. Most of the surficial soil materials at Fairchild AFB retain and transmit water. Groundwater levels in the central base area are 5 to 10 feet below ground surface according to U.S. Army Corps of Engineers foundation soil borings. Local well logs indicate that static water levels are deeper than 200 feet in Airway Heights. The base appears to be situated on top of a locally perched aquifer with unknown boundaries. Also unknown is the connection between this perched water and the deeper waters in the basalt aquifer. The IRP Records Search effort has been unsuccessful in identifying any geological or geophysical surveys which define the limits of the perched aquifer or its connection with the deeper aquifer. The principal groundwater reservoir of the Columbia Basin occurs within the Columbia River basalt (Luzier et al., 1974). The Columbia River basalts are characterized by hexagonal fracture or joint patterns. It is in these fractures that large volumes of water are stored and transmitted. Most water supply wells on the plateau in the vicinity of Fairchild AFB draw water from these deeper fractured basalt aquifers. Recharge of groundwater occurs mainly through infiltration of precipitation and streamflow.

Most precipitation falls during the cooler seasons. Surface waters in the vicinity of Fairchild AFB drain to the northeast reaching the Spokane River at a point downstream and northwest of the City of Spokane. Most natural surface drainages on the base and in surrounding areas are intermittent and transmit water only during wetter seasons or during storms. These drainage courses are low relief swales on the plain and are tributary to Deep Creek, the closest stream to the base. Located approximately two miles west of Fairchild AFB, this stream flows north and northeast of the base discharging into the Spokane River.

The composition of the soils underlying the base may be classified as having fair to good porosity and fair permeability. Porosity is the measure of pore spaces in rock or soil and permeability is the ability of rock or soil materials to transmit fluids through interconnected pore spaces. Fine-grained materials such as the near-surface silts and sands beneath Fairchild AFB tend to have high porosities with relatively low permeabilities because the pore throat passages in finer sediments are smaller and the high capillary action of the sediment walls inhibits fluid flow. Thus this phenomena would tend to inhibit the mobilization and transport of hazardous materials to deeper aquifers. However, should hazardous substances migrate into groundwater in the very permeable fractured basalt aquifers, the potential for contaminating water supplies would be substantially increased.

Base water is supplied by a well field at Fort George Wright and on a seasonal basis from Base Well No. 2. The well complex was constructed over a 17-year period beginning in 1943. The well field consists of three wells which draw water from the Spokane Valley aquifer. This aquifer is part of the Spokane Valley-Rathdrum Prairie sole source aquifer. Water is pure enough for consumption directly from the wells. However, chlorination is practiced at the Geiger Reservoir to ensure that water quality meets public health standards. Appendix D contains supplemental potable water quality data.

The Geiger Reservoir is a 480,000-gallon concrete storage facility at Spokane International Airport. It is equipped with four electrically driven pumps that deliver water to the low towers on base through a 16-inch concrete-lined and covered steel pipe. Fairchild AFB uses approximately 90 million gallons

of water per month in summer months and 35 million gallons per month during the winter.

3.5 FLORA, FAUNA, AND ENDANGERED SPECIES

The Columbia Basin physiographic province in the vicinity of Fairchild AFB is characterized as a semiarid region composed of grasslands and channeled basalt scablands. Portions of the rolling Palouse Country, upland and riverine forests, and pothole wetlands are also located north, south and east of the plateau on which the base is located and provide diverse and important wildlife habitat. The native vegetation of all these regions reflect considerable variation as a result of the conditions of surface soils.

Deposits of loess and sand support a few undisturbed areas of desert and grassland vegetation including sagebrush (*Artemisia sp.*), bunch grass (*Festuca viridula*), cheatgrass (*Bromus secalinus*), foxtail (*Alopecurus sp.*), blue bunch wheat grass (*Agropyron spicatum*), reed canary grass (*Phalaris arundinacea*), and greasewood (*Sarcobatus vermiculatus*). Much of the dunes and grasslands within the Palouse country, however, have been converted to agriculture so that today this region represents some of the most valuable wheat production in the world. Mammals common to these grasslands include coyotes (*Canis latrans*), badgers (*Taxidea taxus*), Columbian ground squirrels (*Citellus columbianus*), and northern pocket gophers (*Thomomys talpoides*). Resident birds such as the common harriers (*Circus cyaneus*), black-billed magpies (*Pica pica*), and ringnecked pheasants (*Phasianus colchicus*) are also common.

The channeled scablands which are most characteristic of this region were formed by ancient streams and watercourses which gouged steep ravines down to the underlying basalt. As a result of this erosion, stream-carried sediments accumulated in lowlands forming a multitude of potholes and ponds which are common southeast of Fairchild AFB, particularly in the vicinity of Cheney. These wetlands provide some of the most valuable waterfowl production in the state. Broadleaf cattails (*Typha latifolia*) and hardstem bullrush (*Scirpus acutus*) produce important food and cover for many nesting waterfowl species including Canada geese (*Branta canadensis*), mallards (*Anas platychynchos*), pintails (*A. acuta*), green and blue-winged teal (*A. crecca* and *A. discors*), cinnamon teal (*A. cyanoptera*), redheads (*Aythya americana*), lesser scaup (*Aythya affinis*), and ruddy ducks (*Oxyura jamaicensis*).

The Turnbull National Wildlife Refuge, located four miles south of the City of Cheney, monitors wild populations of the threatened trumpeter swan (Cyanus buccinator). This refuge is the only known nesting site of this bird in Washington State. Migrating waterfowl are also found in these wetlands during the spring and autumn. Numbers of migrating ducks can reach as high as 50,000 birds during the fall (USFWS, 1981). Mammals such as the muskrat (Odontra zibethica), beaver (Castor canadensis), and mink (Mustela vison) are common in the wetlands.

Along uplands and ridges throughout this area are stands of Ponderosa pine (Pinus ponderosa) and in the lowlands and ravines are cottonwoods (Populus balsamifera) and willows (Salix sp.) Uplands surrounding the potholes and marshes support a variety of birds and mammals in aspen groves and open stands of pine. Scattered thickets of serviceberry (Amelanchier sp.), snowberry (Symphoricarpus occidentalis) and wild rose (Rosa multiflora) provide cover and food for a variety of birds and mammels including redtailed hawks (Buteo jamaicensis), great horned owls (Bubo virginianus), California quail (Lophortx californicus), white-tailed deer (Odocoileus virginianus), mountain cottontail rabbits (Sylvilagus nuttalli), and porcupines (Erethizon dorsatum).

In the immediate vicinity of Fairchild AFB, the area is most characteristic of semiarid grasslands with the vegetation and wildlife commonly associated with this type of habitat. According to the U.S. Fish and Wildlife Service Office of Endangered Species in Boise, Idaho, there are no endangered species or critical habitats in the region of Fairchild AFB or its off-base facilities (Appendix D).

3.6 SUMMARY OF ENVIRONMENTAL CHARACTERISTICS

Generally, the climate in the Fairchild area has the characteristics of a mild, arid region in the summer and a cold coastal region in the winter. Summer temperatures range from 55°F to 85°F and winter temperatures range from 19°F to 31°F (January). The average annual precipitation as measured at Fairchild AFB is 15.95 inches, 70 percent of which falls as snow.

Fairchild AFB is located at an elevation 2,462 feet above sea level on a relatively flat plain that slopes northeasterly towards the Columbia River.

The base is located in the Columbia Basin, which was formed as a result of volcanic activity which flooded much of central and eastern Washington and Oregon with basalt lava flows. The landscape was further modified to its present contour by the continental ice sheets, glacial melt waters and glacially diverted rivers which placed thick deposits of glacial outwash in what is now the Spokane Valley and contiguous plains. These deposits are composed of loosely packed, poorly sorted gravel and sand which provide very high porosity and permeability. Specific yields of wells tapped into the outwash aquifer are commonly 1,000 gallons or more per minute for each foot of draw-down. The water supply for Fairchild AFB is drawn from wells which tap the Spokane Valley aquifer. Groundwater levels at Fairchild AFB are 5 to 10 feet below ground surface indicating that a locally perched aquifer is situated above the deeper basalt aquifer.

Since most of the land in the immediate vicinity of Fairchild AFB has been converted to agricultural uses, few undisturbed areas of native vegetation remain. Mammals common to this area include coyotes, badgers, Columbian ground squirrels and northern pocket gophers. Potholes and ponds, which are common near Fairchild AFB, provide a valuable habitat for many resident and migratory birds. The Turnbull National Wildlife Refuge, approximately 15 miles south of Fairchild monitors wild populations of the threatened Trumpeter Swan. No endangered species or critical habitats are present on Fairchild AFB or its off-base facilities.

4.0 FINDINGS

4.1 BASE ACTIVITY REVIEW

The storage and disposal of hazardous materials is a potential source of environmental contamination. A base activity review was initiated to provide a thorough summary of Fairchild AFB industrial operations or activities that handle hazardous materials and which may generate hazardous wastes. This review consisted of a records and file search, interviews with base personnel and relevant regulatory agencies, and a field reconnaissance of the entire base and off-base facilities to locate and delineate the extent of past and current solid and liquid waste disposal sites (see Section 5.0 for off-base facilities). This section summarizes those findings and includes the identification of those activities that use and/or generate hazardous substances, a description of waste disposal methods, the identification of disposal and spill sites, and an evaluation of the potential for environmental contamination.

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) defines a hazardous substance as any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act (FWPCA). A hazardous waste "may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of or otherwise managed" (Sec. 1004[2][B] of RCRA).

Interviews with 93 individuals in conjunction with field investigations resulted in the identification of 22 past or current waste disposal sites. These sites include four industrial shops; one POL tank storage and fuel sludge disposal area, and four POL spill sites; nine solid waste disposal sites, only two of which are actually landfills; two wastewater treatment sites; and one fire training site. Additionally, there is one off-base location where past disposal practices of waste oils and solvents present potential for environmental contamination. A summary of all documented sites is presented in Table 4.1.

Table 4.1

POTENTIAL HAZARDOUS WASTE DISPOSAL SITES FAIRCHILD AIR FORCE BASE, WASHINGTON

Site No.	Site Name	Waste Type
		INDUSTRIAL SHOPS
IS-1	Building 1034, French Drain	Waste Solvents, Acid Solutions, Cleaning Compounds
IS-2	Civil Engineering Storage Facility	Chemical Decontaminants
IS-3	Building 2150, Reciprocating Engine Test Cell	Waste Oils and Fuels
IS-4	Jet Engine Test Cell	Waste Oils
		PETROLEUM, OILS AND LUBRICANTS SYSTEM
PS-1	POL Bulk Storage Tanks	Fuel Sludges
PS-2	Refueling Pits #18 and #19	JP-4; One Spill
PS-3	Area C Pumphouse Fueling	JP-4; Three Spills, Fuel Sludges
PS-4	Pumphouse B	JP-4; AVGAS
PS-5	Flightline Fuel Spills	JP-4
		SOLID WASTE DISPOSAL
SW-1	Base Landfill NE of Taxiway 8	Misc. Sanitary and Industrial Wastes
SW-2	Waste Disposal NE Corner of Wherry	Lumber Storage, Construction/Demolition Wastes
SW-3	Waste Disposal SW of POL Bulk Storage Tanks	Demolition Wastes
SW-4	Waste Disposal N of Building 2451	Construction/Demolition Wastes
SW-5	Incinerator at DPDO Yard	Paper, Plastics
SW-6	Radioactive Waste Disposal at Deep Creek AFS	Liquid and Dry Radioactive Wastes
SW-7	Waste Disposal S of Taxiway 10	Demolition Wastes
SW-8	Base Landfill at Craig Road	Misc. Sanitary and Industrial Wastes
SW-9	Radioactive Waste Disposal at Wastewater Treatment Plant	Low-Level Hospital Rad Waste
		WASTEWATER TREATMENT
WW-1	Industrial Waste Lagoons	JP-4, Waste Oil, Industrial Solvents, Acids, Cleaning Compounds
WW-2	Sanitary Wastewater Treatment Plant	Sanitary Wastes, Cleaning Compounds, Industrial Solvents, Acids
		FIRE TRAINING
FT-1	Fire Training Area	JP-4, Waste Oil and Solvents, Sludges
		OFF-BASE LOCATIONS
OB-1	OLAA 25 ADS Mica Peak Joint Surveillance Station	Waste Oils, Solvents

Based on the IRP Phase I investigation, USAF operations at Fairchild AFB associated with hazardous substances or wastes include the following activities:

- Industrial shops/maintenance activities
- Liquid fuels storage and aircraft fueling activities
- Solid waste disposal
- Wastewater treatment
- Fire training
- Off-base locations
- Hazardous materials storage

The activities of primary concern include solid and liquid wastes disposal, liquid fuels management, and shop and off-base maintenance activities.

Storage of hazardous wastes and materials which are handled through either the 92nd Supply Squadron for new items or DPDO for waste materials were determined not to pose environmental or human health risks. Both of these facilities maintain up-to-date records of all materials and store them in such a manner as to reduce any risks of spills or commingling of incompatible waste types. Prior to mid-1983, DPDO maintained storage locations for hazardous and recyclable materials inside Buildings 2451 (Bay D) and 2150, and outside in the DPDO storage yard northwest of the POL bulk storage tanks near Building 2447. Both buildings store PCB materials such as old transformers and capacitors. This equipment is stored in sealed drums and clearly identified. Wastes regulated by RCRA are currently stored at the DPDO yard, and PCB wastes regulated by the Toxic Substances Control Act (TSCA) are stored in Building 2451. Waste solvents, paints, thinners, and other items generated at Fairchild AFB are also contained in drums, marked, and stored on pallets. All of these materials are removed from the base by an approved waste hauler. The outside storage area is fenced and locked. All exterior drum storage is on pallets and in Conex® containers as required by the Washington State Department of Ecology in accordance with the State Hazardous Waste Regulation WAC 173-303.

There was no evidence of spills or improper materials handling at any location as viewed during the IRP field investigations. Records have been maintained by the DPDO since 1980 when they assumed hazardous wastes responsibility.

maintenance. All runway repair mixtures were totally used in process with empty containers disposed in the landfill.

From 1943 until 1969, Fairchild AFB had a dry cleaner located on the corner of 5th and Arnold. This building has since been torn down. Petroleum (Stoddard solution) and synthetic (perchlorethylene) solvents were used for clothes cleaning. Waste quantities from the dry cleaning facility were probably small because the liquids either volatilized or were recycled. However, it was reported that used filters and small quantities (one gallon/month) of waste solvents were disposed in the base landfills. Occasional spills are also known to have occurred, but this material was washed with laundry water into the storm drain.

Toxic chemicals utilized in the auto, hobby, and arts and crafts shops included paints and primers, lacquers, glues, hardeners, polishing compounds, oils, and solvents. Quantities of all of these materials are small and used in consumption. Empty containers and solvent-saturated rags are disposed in the trash. Photographic chemicals used by the Non-Destructive Inspection Shop are flushed into the sanitary sewer. Trichloroethane is also used and is recycled. The Paint Shop reported that waste thinners are returned to DPDO while paints (primarily latex) are used in consumption. Approximately 180 gallons/year of paints and thinners were reported by the base Civil Engineer in 1975 as having been disposed in the base landfills (Battelle, 1975). One of these landfills is located near Taxiway 8 at the southwest end of the runway and the other is located near the wastewater treatment plant. It is unknown how long this practice occurred, although retirees with experience from the early 1940s also reported the landfilling of paint wastes in the base landfills.

Inspections were performed at the principal industrial shops associated with 92nd Bomb Wing Heavy, 92nd Combat Support Group, DET24-40th Aerospace Rescue and Recovery Squadron, and Washington Air National Guard. Generally, the shops were clean and new and waste solvents, oils, and other chemicals were stored appropriately. Most industrial shops are equipped with oil/water separators to remove the light and heavy fraction wastes. Occasionally, however, light fraction wastes are washed through to the industrial waste lagoons or to

Dilute and concentrated solutions of degreasers, acid solutions, solvents including halogenated and nonhalogenated materials, paint waste residues, paint strippers and thinners, tank sludges, metal brighteners, washrack, and washdown residues are generated in Corrosion Control, Repair and Reclamation, Vehicle Maintenance, Power Plant, Flightline Maintenance, Inspection, Propulsion, and Instruments Branch Shops. Chemicals utlized by many of these shops include PD-680 (a dry cleaning solvent used for degreasing metal parts); trichloroethane; acetone; toluene; and methyl ethyl ketone. Some of these wastes were batched and burned at the Fire Training Area. Often they were rinsed with wash waters and flushed into the sanitary or storm sewer system. Currently, concentrated waste solutions are stored in drums and returned to DPDO for handling. Once they are diluted with wash waters, however, most solvents are unreclaimable and are flushed into the sanitary sewer. Spills are often washed into drains or absorbed with sweeping compounds which are disposed with solid waste. Cleaning rags are also disposed in the trash.

Hydraulic fluids, engine and cutting oils, brake and transmission fluids, lubricating and gear oils, and waste fuels were traditionally sent to the fire training area or were recycled. From the mid-1970s until 1983 some oils and solvents were burned at the Deep Creek Heating Plant. Since 1983, waste oils have been recycled through DPDO and its contract waste hauler.

Pavements and Grounds Shop personnel reported utilizing some waste oils for dust control and as a herbicide during the 1950s and 1960s. Pulp liquor from a paper mill located in the Spokane Valley was also spread on the base roads as a means of dust control. Approximately 300 gallons of this material was used each summer. The spent liquor is suspected of containing waste phenolic residues. This practice was discontinued around 1965. Herbicides were sprayed on vegetation along the flightline or near the weapons storage areas. An estimated five to ten barrels per year were used in process for weed control. Empty barrels were disposed in the base landfill. Today and in the past, pesticides and herbicides have been used up in consumption with no liquid wastes reported. During the course of the last 15 years, the standard disposal procedure has been to triple-rinse all empty pesticide and herbicide containers before disposal. Paving materials such as liquid asphalts, emulsifiers, epoxy's, and penetrant sealers are used for runway repair. Water suspended asphalt mixtures or slurries have also been used on the runway for

Table 4.4 (cont'd)

Shop Name	Bldg #	Waste Material	Quantity	Method(s) of Treatment, Storage and Disposal
				1940 1950 1960 1970 1980
3636th Combat Crew Training Wing				
• Resource Management, Vehicle Maintenance	1212	PD-680	5-10 gal/yr	Contractor Recycle DPDO
		Waste Oils	50-70 gal/yr	Contractor Recycle DPDO
Det 24-40th Aerospace Rescue & Recovery Squad.				
• ARRS Maintenance Shop	1005	PD-680	55 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
		Hydraulic Fluid	<15 gal/yr	Contractor Recycle DPDO
		Engine Oil	55-110 gal/yr	Contractor Recycle DPDO
		Waste Oil	<300 gal/yr	Fire Training

---------- Suspected
———— Confirmed

Table 4.4 (cont'd)

Shop Name	Bldg #	Waste Material	Quantity	Method(s) of Treatment, Storage and Disposal (1940 1950 1960 1970 1980)
TENANT ORGANIZATIONS				
Washington Air National Guard				
• Fuels Shop	1029	Waste JP-4	330 gal/yr	Recycled or to Fire Training
		Waste AVGAS	110 gal/yr	Recycled or to Fire Training
• Vehicle Maintenance & Operations	446	111-Trichlorethane	1 pt/yr	Dumped Outside Building
		Hydrochloric Acid	1½ gal/yr	Neutralize then to Sanitary Sewer
		Waste Oils (Cutting and Hydraulic)	500 gal/yr	Burned at Deep Creek Heat Plant DPDO/Contractor
		Stoddard Solvent	100 gal/yr	Burned at Deep Creek Heat Plant DPDO/Contractor
• Electric Shop	1034	Boric Acid	6 gal/yr	Sanitary Sewer
• Pneudraulics	1034	111-Trichlorethane	50 gal/yr	Evaporation
		Waste Hydraulic Fluid	120 gal/yr	Burned at Deep Creek Heat Plant DPDO
		"Safety Kleen" Solvent	110 gal/yr	Contractor Removal
• Repair and Reclamation	1034	PD-680	20 gal/mo	Burned at Deep Creek Heat Plant DPDO
• Wheel and Tire	1034	Penetone, Formula 724	50 gal/yr	DPDO
		PD-680	50 gal/yr	Burned at Deep Creek Heat Plant
		Paint Stripper	110 gal/yr	DPDO
• Aerospace Ground Equipment	1034	PD-680	20 gal/yr	Storm Sewer
		"Safety Kleen" Solvent	475 gal/yr	Contractor Recycle
		Waste Oils	55 gal/yr	Burned at Deep Creek Heat Plant DPDO
		Brerlin 817 MS	120 gal/yr	Storm Sewer
		Battery Acid	10 gal/yr	Neutralized to Storm Sewer
• Corrosion Control	1060	Brerlin 815 MX	660 gal/yr	Storm Sewer
		PD-680	120 gal/yr	Burned at Deep Creek Heat Plant DPDO
		Waste Paint	25-45 gal/yr	DPDO
• Jet Engine Shop	2163	PD-680	60-120 gal/yr	Burned at Deep Creek Heat Plant
		Waste JP-4*	120 gal/yr	Burned at Deep Creek Heat Plant DPDO
		Waste Engine Oil	20 gal/yr	Burned at Deep Creek Heat Plant DPDO
		Penetone	60-120 gal/yr	DPDO

---------- Suspected
———— Confirmed
*Disposed with 92nd Jet Shop Wastes

Table 4.4 (cont'd)

Shop Name	Bldg #	Waste Material	Quantity	Method(s) of Treatment, Storage and Disposal (1940 1950 1960 1970 1980)
• Physiological Training	2001B	Lube Oil	220 gal/yr	Contractor Recycle* DPDO
		Air Compressor Oil	20 gal/yr	Contractor Recycle* DPDO
92nd COMBAT SUPPORT GROUP				
Morale, Welfare and Recreation Division				
• Automotive Hobby Shop	285	Waste Oils	3000 gal/yr	Contractor Recycle*
		PD-680 (No Longer Used)		
		"Safety Kleen" Solvent	950 gal/yr	Contractor Removal
Operation and Training Div				
• Small Arms	2001D	Methyl Isobutyl Ketone	6 gal/yr	Sanitary Sewer
		Rifle Bore Cleaner	5 gal/yr	Sanitary Sewer
		PD-680	5 gal/yr	Sanitary Sewer
92nd Civil Engineering Squadron				
• Fire Department	3	Aqueous Film Forming Foam	2550 gal/yr	Fire Training
		Potassium Bicarbonate	3225 lb/yr	Fire Fighting/Training
		Halon	21,000 lb/yr	Fire Fighting/Training
• Paint Shop	2451	Lacquer Thinner	55 gal/yr	Local Landfill Stored On-Site DPDO
		Paint Thinner	55 gal/yr	Local Landfill Stored On-Site DPDO
• Pavements and Grounds	2025	Cleaning Compound (Degreaser)	330-385 gal/yr	Storm Sewer
• Power Production	2451	PD-680	55 gal/yr	Burned at Deep Creek Heat Plant DPDO
		Waste Oils	700 gal/yr	Contractor Recycle*
		Cleaning Compounds	165 gal/yr	Sanitary Sewer

---------- Suspected
———————— Confirmed
*Exact Year Unknown

Table 4.4 (cont'd)

Shop Name	Bldg #	Waste Material	Quantity	Method(s) of Treatment, Storage and Disposal (1940 1950 1960 1970 1980)
		PD-680	110 gal/yr	Fire Training Deep Creek Heat Plant DPDO
• SRAM Maintenance	1409	Hydraulic Fluid	36 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
		PD-680	12 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
92nd Organizational Maintenance				
• Bomber Branch	1017	Waste JP-4	61,400 gal/yr	Reused in Support Branch AGE Equip.
		Waste Oils	<55 gal/yr	Contractor Recycle* DPDO
• Inspection Branch	1021	PD-680	10,400 gal/yr	Separator, Sanitary Sewer
		815-MX Cleaning Compound	3,600 gal/yr	Separator, Sanitary Sewer
• Support Branch	1013	PD-680	1200 gal/yr	Separator, Sanitary Sewer
		Waste Oils	55 gal/yr	Contractor Recycle* DPDO
		Cleaning Compound	660 gal/yr	Separator, Sanitary Sewer
		Paint Stripper	12 gal/yr	Separator, Sanitary Sewer
• Tanker Branch	1017	Waste JP-4	26,500 gal/yr	Reused in Support Branch AGE Equip.
		Waste Oils	<55 gal/yr	Contractor Recycle* DPDO
92nd Transportation Squadron				
• Vehicle Maintenance (General)	2115	Battery Acid	100 gal/yr	Neutralize to Sanitary Sewer
		PD-680	200 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
• Paint/Body Shop	2115	Sulfuric Acid	24 gal/yr	Neutralize to Sanitary Sewer
• Refueling Maintenance	1060	Waste Lube Oil	120 gal/yr	Contractor Recycle* DPDO
USAF Hospital				
• Radiology Service/X-Ray	9000	Film Fixer	720 gal/yr	Recover Silver then to Sanitary Sewer
		Film Developer	480 gal/yr	Sanitary Sewer
• Chemistry Laboratory	9000	Methanol	7 gal/yr	Diluted then to Sanitary Sewer
		Ethyl Acetate	2 gal/yr	Diluted then to Sanitary Sewer
		Acetone	2 gal/yr	Diluted then to Sanitary Sewer
		Hydrochloric Acid	7 gal/yr	Diluted then to Sanitary Sewer
		Sulfosalicylic Acid	1 pt/yr	Diluted then to Sanitary Sewer

---------- Suspected
———— Confirmed
*Exact Year Unknown

Table 4.4 (cont'd)

Shop Name	Bldg #	Waste Material	Quantity	Method(s) of Treatment, Storage and Disposal
				1940 1950 1960 1970 1980
• Welding Shop	2050	Chemical Metal ID Kit:	1 Kit/yr	DPDO
		Sodium Sulfide	12 oz/yr	DPDO
		Acetone	12 oz/yr	DPDO
		Dimethylglyoxime	12 oz/yr	DPDO
		Lead Acetate	12 oz/yr	DPDO
		Sodium Hydroxide	12 oz/yr	DPDO
		Cupric Chloride	12 oz/yr	DPDO
		Nitric Acid	12 oz/yr	DPDO
		Cadmium Chloride	12 oz/yr	DPDO
		Ammonium Hydroxide	12 oz/yr	DPDO
		Sulfuric Acid	12 oz/yr	DPDO
		Ammonium Molybdate	12 oz/yr	DPDO
• Propulsion Engine Shop (Test Cell)	2163	Paint Remover	18 gal/yr	Separator-Storm Sewer
		Engine Cleaning Comp	60 gal/yr	Separator-Storm Sewer
		*Carbon Removing Comp	360 gal/yr	Storm Sewer
		*Carbon Removing Comp	216 gal/yr	Neutralize to Storm Sewer
		Aircraft Lube Oil, gd 10-10	12 gal/yr	Fire Training Burn at Deep Creek Heat Plant Contractor Recycle
		Aircraft Calibration Fluid	120 gal/yr	Fire Training Burn at Deep Creek Heat Plant Contractor Recycle
		Aircraft Lube Oil, gd 7808	360 gal/yr	Fire Training Burn at Deep Creek Heat Plant Contractor Recycle
		PD-680	300 gal/yr	Fire Training Burn at Deep Creek Heat Plant Contractor Recycle
		Aircraft Cleaning Compound	660 gal/yr	Separator to Storm Drain
		JP-4	60 gal/yr	Burn at Deep Creek Heat Plant DPDO
92nd Munitions Maintenance				
• Equipment Maintenance	1419	Hydraulic Fluid	275-330gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
		Gear Oil	85 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO

---------- Suspected
———————— Confirmed
*Crysilic acid and ortho-creosole

Table 4.4

INDUSTRIAL OPERATIONS (SHOPS) WASTE GENERATION FAIRCHILD AIR FORCE BASE, WASHINGTON

Shop Name	Bldg #	Waste Material	Quantity	Method(s) of Treatment, Storage and Disposal
92nd BOMB WING HEAVY				1940 1950 1960 1970 1980
92nd Field Maintenance				
• Aerospace Ground Equip.	2050	MOGAS	<1 drum/yr	Fire Training DPDO
		Diesel	<1 drum/yr	Fire Training DPDO
		JP-4	110 gal/yr	Fire Training DPDO
		Hydraulic Fluid	15 gal/yr	Mixed with Waste Oil and Sold
		Oil Engine/Hvy Duty	<1 drum/yr	Burned at Deep Creek Heat Plant DPDO
		Turbine Oil	20 gal/yr	Mixed with Waste Oil and Sold DPDO
		General Oil	1 gal/yr	Mixed with Waste Oil and Sold DPDO
• Electrical Systems	2050	Sulfuric Acid	50 gal/yr	Neutralize & Discharge to Sanitary Sewer
• Environmental Systems	2050	Waste Oils	15 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
• Pneudraulics	2050	Waste Hydraulic Oil	110-165 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
		PD-680	110 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
• Repair and Reclamation	2050	PD-680	800 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
• Corrosion Control	2050	Waste Solvent, Thinners, Paint Residual, Paint Strippers	950-1430 gal/yr	Salvaged/Recycled DPDO
• Machine Shop	2050	Machine Oil	10 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
		Soluble Oil	20 gal/yr	Fire Training Burn at Deep Creek Heat Plant DPDO
• Non Destructive Inspection	2050	Trichloroethane	180 gal/yr	Recycled DPDO
		X-Ray Developer	120 gal/yr	Sanitary Sewer
		X-Ray Film Fixer	120 gal/yr	Sanitary Sewer
		Fluorescent Penetrant	110 gal/yr	Sanitary Sewer DPDO
		Emulsifier	110 gal/yr	Sanitary Sewer DPDO
		Developer	150 lbs/yr	Sanitary Sewer
		PD-680	180 Gal/yr	Fire Training Burn at Deep Creek Heat Plant

---------- Suspected
———— Confirmed

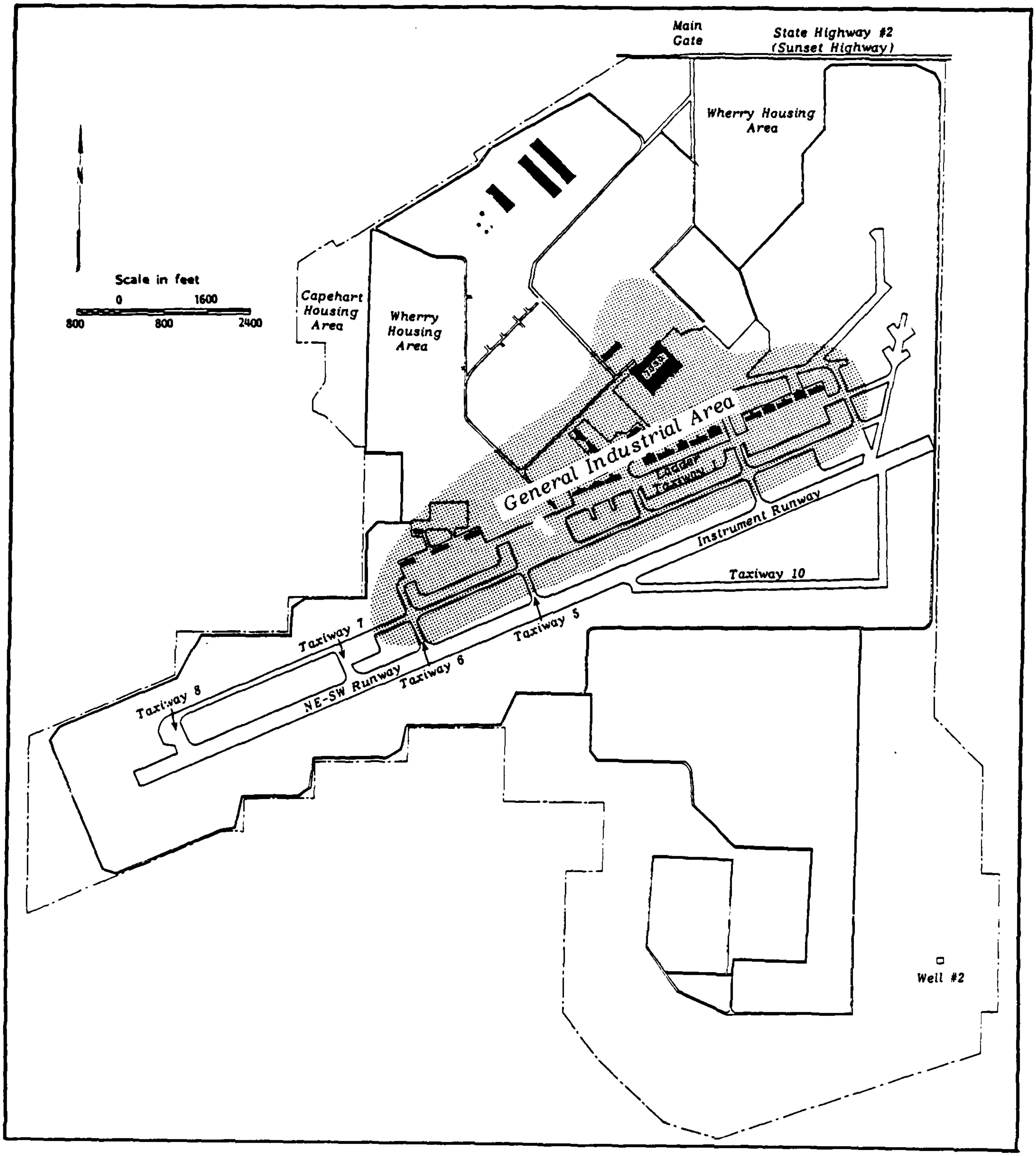

Figure 4.1

GENERAL SHOP AND INDUSTRIAL AREA
FAIRCHILD AIR FORCE BASE, WASHINGTON

The major industrial area at Fairchild AFB is located behind the Field Maintenance Hangar and along the northwest corridor of the flightline (Figure 4.1). This remains the primary industrial area today. Buildings 1021, 1034, 1060, 2025, 2050, 2115, and 2451 were determi d to be the primary sources for industrial waste generation.

Table 4.4 identifies Fairchild shops that generate industrial wastes by location, waste material and quantities, and methods of treatment, storage, and/or disposal of these wastes. A master list of all base industrial shops is included in Appendix E. Based on interviews with shop staff and from records of the Bioenvironmental Engineering Section, accurate waste treatment, storage, and disposal information is only available from the late 1970s. Earlier documentation for waste handling and ultimate disposal is nonexistent. The fate of many industrial wastes is speculative based on the nature of the material and the means of disposal typical at a particular time. Retired interviewees who had managed or worked in shops such as Pavements and Grounds, Field Maintenance, Airfield Management, Utilities, and Electrical, all believe that industrial shop wastes were disposed primarily in base landfills. Their accounts varied only in the quantities of wastes and frequency of disposal and not in location and the sources of wastes.

Fairchild AFB has been a center for major aircraft maintenance and overhaul activities since 1942. During World War II, the base served as a depot for supporting the Alaskan bases as well as a refit or rebuilding center for aircraft. Maintenance activities included electroplating, aircraft paint preparation using solvents such as carbon tetrachloride, and reciprocating engine rebuilding. Waste materials from all of these activities were believed to be either disposed in base landfills or flushed into floor drains. As Fairchild AFB expanded during the 1950s and 1960s, aircraft repair and maintenance continued. Conversion to jet aircraft and the addition of the Atlas Intercontinental Ballistic Missile increased the shop activities and waste materials in order to fulfill base mission responsibilities. Today, the missiles are no longer present at Fairchild AFB, but the mixed force of B-52 Stratofortresses and KC-135 Stratotankers require continuous preventive maintenance and necessary repairs which generate waste materials.

Table 4.3

SUMMARY OF FLOW CHART LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT FAIRCHILD AIR FORCE BASE

Site No.	Site Description	Potential for Contamination	Potential for Contaminant Migration	HARM Rating
IS-1	Building 1034, French Drain	YES	YES	YES
IS-2	Civil Engineering Storage Facility	NO	NO	NO
IS-3	Building 2150, Reciprocating Engine Test Cell	YES	YES	YES
IS-4	Jet Engine Test Cell	YES	YES	YES
PS-1	POL Bulk Storage Tanks	YES	YES	YES
PS-2	Refueling Pits #18 and #19	YES	YES	YES
PS-3	Area C Pumphouse Fueling	YES	YES	YES
PS-4	Pumphouse B	YES	YES	YES
PS-5	Flightline Fuel Spills	YES	YES	NO[a]
SW-1	Base Sanitary Landfill NE of Taxiway 8	YES	YES	YES
SW-2	Waste Disposal NE Corner of Wherry	NO	NO	NO
SW-3	Waste Disposal SW of POL Bulk Storage Tanks	NO	NO	NO
SW-4	Waste Disposal North of Building 2451	NO	NO	NO
SW-5	Incinerator at DPDO Yard	NO	NO	NO
SW-6	Radioactive Waste Disposal at Deep Creek AFS	NO	NO	NO
SW-7	Waste Disposal South of Taxiway 10	NO	NO	NO
SW-8	Base Landfill at Craig Road	YES	YES	YES
SW-9	Radioactive Waste Disposal at Wastewater Treatment Plant	NO	NO	NO
WW-1	Industrial Waste Lagoons	YES	YES	YES
WW-2	Sanitary Wastewater Treatment Plant	YES	YES	YES
FT-1	Fire Training Area	YES	YES	YES
OB-1	OLAA 25 ADS Mica Peak JSS	YES	YES	YES

[a]refer to Site WW-1

A portion of the base's wastes are disposed through the sanitary or storm sewer systems. Other wastes are contract-removed, ultimately ending up in local landfills or designated hazardous waste disposal areas such as Arlington, Oregon. Still other materials are sold or recycled. Past disposal practices at Fairchild AFB included on-site disposal of many or all of the above waste types. The following section identifies the major waste generators and base disposal site identification where these types of wastes may have been disposed.

4.2 WASTE GENERATORS AND DISPOSAL SITE IDENTIFICATION

The goal of this IRP Phase I records search is to identify all past and current waste disposal sites at Fairchild AFB and its off-site properties which have the potential to cause environmental contamination and then determine the relative degree of environmental health risk associated with each disposal site. A total of 22 sites and/or activities were identified which were considered to present a potential for environmental contamination. These sites were evaluated using the decision flow chart presented in Figure 1.1. Sites not considered to have a potential for contamination were deleted from further evaluation. The sites which have potential for contamination and migration of contaminants were evaluated using HARM. Table 4.3 summarizes the results of the decision flow chart. Twelve sites were determined to require HARM scoring. The rational for the selection of these sites, as well as the rational for omitting the remaining 10 sites, is discussed in Sections 4.2.1 through 4.2.5. Hazardous waste generators, activities, and disposal sites have been divided into the following categories and report sections:

- 4.2.1 Industrial Shops
- 4.2.2 Petroleum, Oils and Lubricants System
- 4.2.3 Solid Waste Disposal
- 4.2.4 Wastewater Treatment
- 4.2.5 Fire Training

4.2.1 Industrial Shops

Several industrial shops handle and generate waste materials that are considered hazardous. Despite the use of these materials, there are few records or reports of spills. However, personal interviews indicate there has been improper handling of toxic substances.

Table 4.2

CATEGORIES AND APPROXIMATED QUANTITIES OF HAZARDOUS AND RECYCLABLE WASTES GENERATED AT FAIRCHILD AIR FORCE BASE[a]

SOLVENTS

PD-680
Trichlorethane
Engine Cleaning Compound
Carbon Removing Compound
Aircraft Cleaning Compound
815-MX Cleaning Compound
Methanol
Acetone
Ethyl Acetate
Degreaser
TCE
Stoddard
"Safety Klean"
Penetone, Formula 724
Methyl Isobutyl Ketone
Paint Thinners and Residues
Waste Paint

TOTAL 26,595 gal/yr[c]

OILS

Hydraulic Fluid
OE/HDO (30 wt)
Turbine Oil
Waste Oils
Machine Oil
Soluble Oil
Gear Oil
Lube Oil
Air Compressor Oil
Cutting Oil

TOTAL 6,253 gal/yr

FUELS

Mogas
Avgas
JP-9
JP-10
JP-4
Diesel

TOTAL 88,890 gal/yr[b]

ACIDS

Sulfuric
Battery
Hydrochloric
Boric
Sulfosalicylic

TOTAL 199 gal/yr

PHOTOGRAPHIC CHEMICALS

Developer
Fixer
Emulsifier
Fluorescent Penetrant

TOTAL 1,660 gal/yr

GRAND TOTAL OF ALL WASTE TYPES: 123,597 gal (2,247 drums)

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[a] Source: Fairchild AFB Bioenvironmental Engineering Files, Form 2761, Hazardous Materials Data.
[b] Not including spills.
[c] Waste solvent quantities are raw product volumes since loss due to volatization of materials cannot be determined. Quantities disposed in either drainage systems or DPDO are much less and/or are diluted.

These records indicate quantities and types of all materials transferred to the waste hauler as well as the final destination of these wastes. Recyclable products such as batteries waste oils, fuels, and precious metals are also contracted for removal.

Waste oils and fuels are collected in two locations, 92nd Transportation Squadron and 141st Air National Guard, where a contracted waste hauler removes them from the base. All base shops are responsible for transporting their waste oils to these locations. Historically, waste oils and fuels are also believed to have been recycled unless they were unrecoverable as in a spill situation, because they could be reused or sold.

Due to the size of Fairchild AFB and its mission, hazardous wastes which have been or are currently being generated are varied in chemical type and can be considerable in quantity due to its extensive aircraft operation and maintenance responsibilities. Currently, the total quantities of waste fuel and other hazardous wastes generated at Fairchild AFB can reach as much as 123,600 gallons per year. Approximately 95,000 gallons of this total amount are waste fuels and oils which are recycled or reused. Solvents make up 21 percent of the total hazardous waste quantity generated at Fairchild AFB, amounting to nearly 26,600 gallons per year. It is estimated that about 22 percent of all waste solvents are recycled by a contractor or through DPDO. DPDO manifests indicate that there were 6,000 gallons of waste solvents removed during the 10-month period ending June 1984. Most solvents, however are discharged to the sanitary or storm sewer systems from aircraft washing operations. Acids and photographic chemicals make up the remaining two percent of hazardous wastes generated at Fairchild. In nearly all cases, these wastes are washed down the sanitary or storm sewer.

Table 4.2 presents a breakdown of all the major waste categories and total quantities used or generated at Fairchild AFB. It should be pointed out that the reported quantities of the volatile solvents used for aircraft maintenance represent not only what is disposed but also what is utilized. A great percentage of that material is either used in process or evaporates upon application. The residues that are reclaimed, however, are contained in drums for DPDO disposal.

the wastewater treatment plant. These two treatment facilities are discussed in further detail in Section 4.2.4.

Four industrial sites deserve further consideration because they do not discharge shop wastewaters to either treatment system. These shops are Building 1034, the Civil Engineering Storage Facility, Building 2150, and the Jet Engine Test Cell. The following industrial site descriptions present the environmental concerns regarding the waste disposal practices at these sites and provide the rational for selection or rejection of the site for HARM ranking. Work sheets for the selected sites are presented in Appendix J.

Site IS-1, Building 1034, French Drain

Building 1034 was constructed in 1978 to house a portion of the Consolidated Aircraft Maintenance (CAM) Squadron of the Washington Air National Guard (WANG) (see Figure 4.2). This facility is located at the southwest end of the runway north of Taxiway 7. Several of the WANG maintenance shops are located within this building, including the Electric, Environmental, Pneudraulics, Wheel and Tire, Machine, Metal Processing, Welding, and Avionics Maintenance. This building is equipped with floor drains that discharge the collected wastewater to a french drain system outside and southwest of Building 1034. This drain system consists of five dry wells connected in series. Each dry well consists of a concrete casing approximately 2.5 feet in diameter and at least five feet deep with a gravel-packed bottom. It is reported that the casing walls are perforated, and there is no protective barrier around the drain system. It is uncertain how deep these casings actually extend into the ground.

Moderate amounts of hazardous materials are used by the WANG maintenance shops in Building 1034 (see Table 4.4). Fortunately, only small quantities of these materials are believed to have been washed into the ground via the french drain. This belief is based on the age of the facility (six years) and the implementation of standard operating procedures that controlled use and disposal of hazardous material on base. It is conservatively estimated that the following materials were ultimately disposed in this drain system: 120 gallons of PD-680, 720 gallons of cleaning compounds, and 105 gallons of acid solutions.

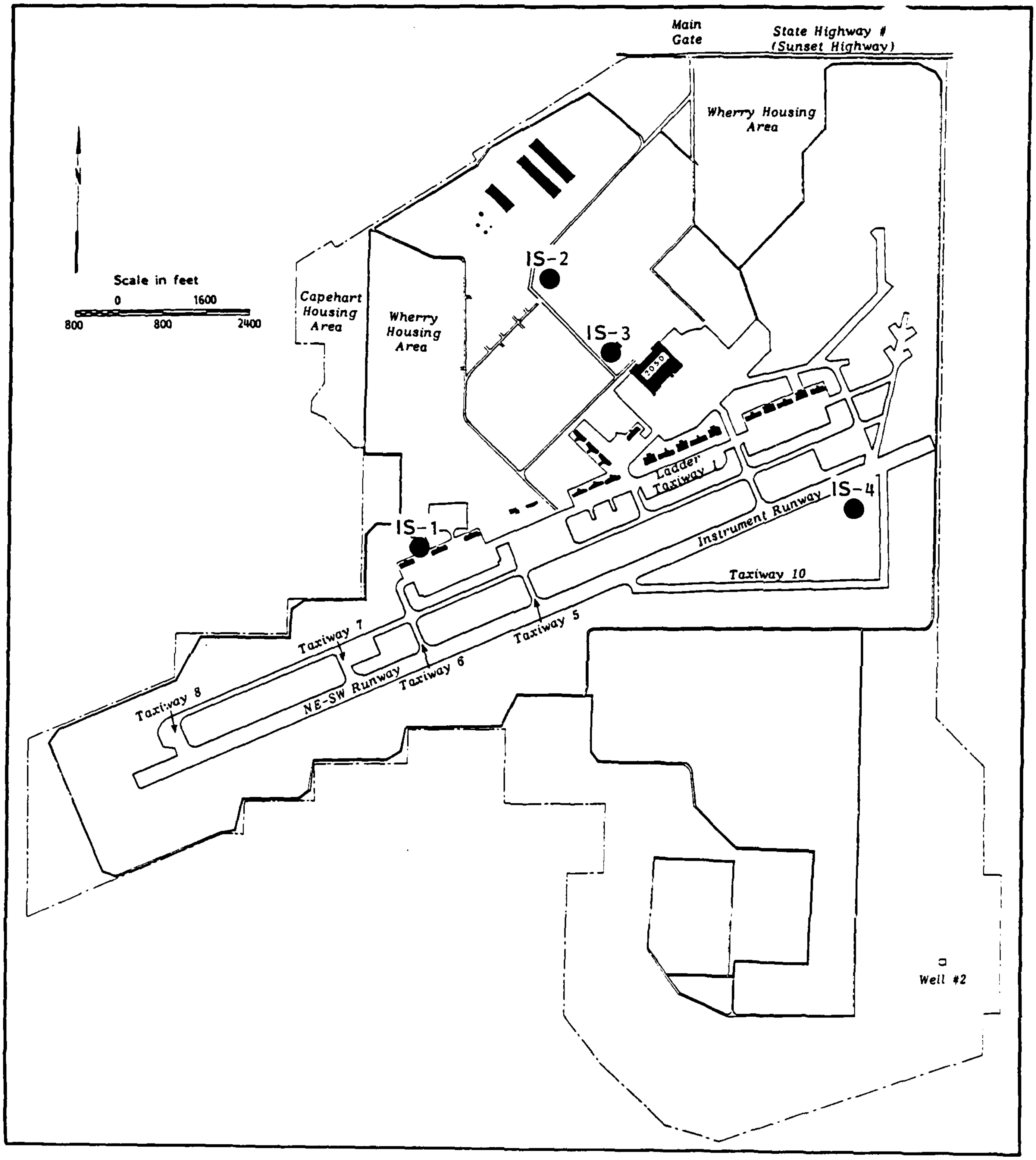

Figure 4.2

INDUSTRIAL SITES IS-1 THROUGH IS-4
FAIRCHILD AIR FORCE BASE, WASHINGTON

Groundwater level at this site is reported to be between five and 10 feet. Soils are predominantly sandy. Due to shallow groundwater and the permeable nature of the soils, the potential exists for groundwater contamination from the material in the drain system of Building 1034. Therefore HARM scoring of this site is required.

Site IS-2, Civil Engineering Storage Facility

A warehouse is referred to on an old base map as an Army Civil Engineering Storage Facility. More recently, the facility was used by Base Disaster Preparedness for storage of chemical decontaminants. Figure 4.2 presented the location of this site. It was reported that at one time this facility was used as the base morgue. One retiree recalled that this warehouse was constructed of asbestos cement. The observations were confirmed by the Base Disaster Preparedness office which also reported that the stored decontaminant materials (a chemical known as DS-2) were removed in 1977. It was reported that all SAC bases were required to keep a supply of this agent. When containers at other installations were reported to be leaking, SAC headquarters ordered the removal of this agent from all bases. Approximately 10 five-gallon cans were packed according to prescribed safety shipping regulations and transferred to Utah.

Concern was expressed that some DS-2 had been spilled or had leaked from containers. This concern could not be substantiated through the records search or interview processes. All containers were believed to be in good condition when they were removed, and there are no reported or documented problems during the years this material was stored at Fairchild. Based on the fact that there are no hazardous materials present on this site and the absence of any spill history, a HARM ranking is not required.

Site IS-3, Building 2150, Reciprocating Engine Test Cell

Building 2150 was the site of the reciprocating test cell. This facility was used from 1942 until 1954 when the B-36 was phased out and jet engines were being introduced. Since then the building has been used for many different purposes including storage and some maintenance activities. In the past, there were transformers in the basement which were known to contain dielectric

oils containing polychlorinated biphenyls (PCBs). There are no records of spills or leaks from these transformers. There are also no records of past chemical, fuel, or solvent spills in Building 2150, although it was reported that currently there is hydraulic fluid and antifreeze on the floor of the test cell.

The Base Environmental Coordinator expressed concern that if hazardous wastes are present from past activities, they may present a health hazard for anyone involved in any planned demolition or alteration of this building. It is reported that underground fuel tanks and lines have been pickled (a process used to protect equipment from corrosion by sealing or coating), although it is unclear whether or not all of the tanks and lines were identified during the pickling process. It is possible that lines may have leaked prior to pickling, but if all lines were not thus protected, they may be a source of contamination.

Due to the close proximity of groundwater (5-10 feet from the surface); the permeable nature of this area's soils; the history of fuels, solvents and chemical use and storage; and possible environmental contamination from he activities at this site, HARM scoring is required.

<u>Site IS-4, Jet Engine Test Cell</u>

The jet engine test cell, which was built in 1953, is located south of the east end of the instrument runway and consists of two buildings and one trailer. Waste oils and fuels are stored in drums and delivered to the jet shop when they are full. The jet shop then turns in this material to DPDO for salvage or disposal. Waste oils were observed being washed down a storm sewer during the IRP inspection of the jet engine test cell. This storm drain is not served by an oil/water separator, and discharges directly to a surface ditch which is adjacent to the facility. This ditch flows into the industrial waste lagoons. Base soil borings of the instrument runway area (<50 feet north) indicate soils are predominantly silty sands, underlain by mixed sands, gravels, and clay. Groundwater was reported at 10-13 feet below ground surface (Boring #17, USAF Base Plan, 1969). Surface runoff is seasonal, but is conveyed in this ditch. Because of the observed improper disposal of waste

oils in the storm drainage system, there is a potential for soils and surface water contamination at this site. Therefore, HARM scoring is required.

4.2.2 Petroleum, Oils and Lubricants System

Fuels used at Fairchild AFB include jet fuel (JP-4, 9, and 10)), diesel, aviation fuel (AVGAS), No. 2, 5 and 6 heating oils, and leaded and unleaded automobile gasoline (MOGAS). The Base Liquid Fuels Management Branch also stores and handles deicing fluid. Fuels are delivered to Fairchild AFB via railroad tank cars, trucks, and the Yellowstone Pipe Line which conveys JP-4. According to the USAF Real Property Inventory for Fairchild AFB, there are 38,320 linear feet (7.26 miles) of liquid fuels pipeline that distribute fuels underground from the bulk storage facility to either truck fill stands or to the Area A or Area C pump groups and storage tanks. These pump groups are connected to the hydrant fueling systems located along the aircraft apron and parking hardstands.

Both above and below ground storage accommodate the fuels supply. Aboveground tanks include the POL bulk storage facility located in Area 2400 southeast of the DPDO storage yard, providing a total capacity of 3,150,000 gallons of JP-4. Additional aboveground storage facilities include two 25,000-gallon tanks containing JP-4 at the Yellowstone storage area and heating fuel tanks at each of the 964 Wherry housing units. Underground tanks of JP-4 and JP-9/10 (22 tanks), MOGAS (11 tanks), diesel (12 tanks), and heating oil (256 tanks) are located throughout Fairchild AFB and its off-base properties. Appendix F, the master list of all POL and fuel storage facilities, identifies the location and capacity of each tank. Appendix F also contains the locations and capacities of all fuel transfer areas and chemical storage facilities.

Waste products from the POL bulk storage facility include sludge from tank cleanings and in-line fuel filters. The frequency of cleaning the bulk tanks or replacing line filters and subsequently the generation of waste materials is based on the condition of either tanks or lines. Fuel lines are pressure tested annually and replacement of the total 576 filters is estimated to occur at least once every three years. Fuel quality is the determining factor for filter replacement. Filters are left to air dry in either the northwest

corner of the bulk storage area or around Building 159, the Area C pump group. The filters are then removed by a contract waste-hauler.

Bulk storage tanks are inspected approximately every four years. If a layer of tank sludge is one-half inch or more, the material is removed and deposited to weather in the northwest corner of the bulk storage area or adjacent to the Area C pump group. This allows the volatile components to evaporate, and other petroleum residuals to leach out or percolate into the soil. Once drained and allowed to lose their volatile fractions, the fuel sludges remain in the weathering areas. A site inspection of both weathering areas by the JRB Associates IRP Phase I inspection team discovered that soils in the bulk storage area emitted a strong petroleum odor but no odor was detected from the soils in the Area C compound. There was no evidence of waste piles or stained soils in either location.

The bulk storage weathering area is within protective dikes. These asphalt dikes are severely cracked and eroded in some areas. A rehabilitation project is scheduled for fiscal year 1987 in which all dikes will be lined with gunite. The bulk storage tank bottoms are not believed to be lined. The base Engineering and Construction Branch raised concern over the possibility of soil contamination from the POL bulk storage area. Base Engineering reported that a previous inspection of this area revealed the bottom of JP-4 tank #1 showed signs of corrosion. This tank was repaired in 1981 with an epoxy coating extending four feet up the side wall. Soils in the diked area were reported to be contaminated with fuels to depths of four feet. This was determined by using a posthole digger within the POL bulk storage area. It is unknown if this soil contamination is from leaks or the practice of weathering tank bottoms. An inspection of the tank bottoms and verification of this situation was not possible during the IRP field visit, although the soils did emit a strong fuel odor. A corrosion analysis of Fairchild AFB performed in 1978 reported that the main POL system, which includes the bulk tanks, showed no significant evidence of corrosion (Leavenworth et al., 1978).

The potential for groundwater contamination exists if the conditions reported are as severe as they believe. Groundwater is estimated to be from five to 10 feet from the surface with some seasonal fluctuations. Based on USAF

engineering drawings, the nearest soil borings, taken from 1,000 to 1,600 feet west of the POL bulk storage area, identify the soil as sandy silts underlain by sands and gravels.

The occurrence of fuel spills and the fate of impure fuels and oils have been recorded for approximately 10 years at Fairchild AFB. Official Pollution Incident Reports assembled since 1974 refer principally to fuel spills resulting from tank overflows, bowser leaks or spills, and airplane defueling problems. In addition to the official Pollution Incident Reports, the fire department also maintains records of flightline fuel spills which rarely exceed five to 10 gallons, and are routinely removed from the flightline by washdown. This dilution procedure is preferentially used to safeguard the aircraft and is believed to be of minor significance to the general area with regard to potential fuels contamination. Most fuels are flushed into the ground or the storm drainage system which discharges into an oil skimming pond.

From 4 to 6 June 1983, the U.S. Army Corps of Engineers (COE), Seattle District, dug several test holes in the vicinity of Fairchild's flightline as part of a foundation exploration project. Test Hole 83-PA-73 located adjacent to Valve Pit 19 was discovered to have raw fuel on top of groundwater which was reported to be at five feet below the ground surface. No analyses of this fuel was performed, but it was presumed to be JP-4. The source of this contamination is unknown. Base Engineering is preparing to install additional test holes to determine the source of this contamination.

The major areas where fuel spills have occurred at Fairchild AFB include Buildings 159 and 1013, the flightline ramp, Hangar 1011, and the Fuel Hydrant Stubs 2, 3, 5, 8, 14, 94, and 95. Historical spills, while not recorded, have been confirmed by several retirees. Aside from the routine loss of fuel in quantities less than 50 gallons, only one major spill event was reported by more than one interviewee. In or around 1950, a B-36 bomber aircraft reportedly skidded off the runway and collided with Pumphouse B. The crash destroyed the pumphouse. Total quantities of fuel spilled and recovered in this mishap are unknown; thousands of gallons of AVGAS are believed either to have seeped into the ground around the pumphouse vicinity northwest of Building

2012 and east of Castle Street, or to have been flushed into the storm sewer system.

Table 4.5 presents a summary of all reported fuel spills at Fairchild AFB since January 1974. The following sections briefly summarize the circumstances related to these spills:

- On 22 January 1975, a 278-gallon JP-4 spill occurred near Building 159 and the Area C pump house. The spill was caused by a valve malfunction which permitted fuel to enter and overflow a defueling tank. Spilled fuel was hosed into the soil by the base fire department; none was recovered. An inspection of the general vicinity by the IRP inspection team revealed no indication of fuel-saturated or oil-stained soils.

- On 23 January 1975, a 2,000-gallon JP-4 fuel spill occurred on the flightline ramp in front of Hangar 1021. The spill was caused by an aircraft towing accident in which a KC-135 left wing tank was ruptured. The spilled fuel was flushed into the storm drainage system which discharges into an oil skimming pond located east of the flightline area. Straw was spread on top of the skimming pond to act as a sorbent. Spent straw was collected and disposed of in the base landfill near the wastewater treatment plant. A site inspection of this area by the IRP inspection team reported that most spilled fuels would have entered the storm drainage system and little if any to ambient soils.

- On 7 March 1975, a 100-gallon JP-4 fuel spill occurred at Building 159 and the Area C pumphouse. The spill was a result of a valve malfunction at Refueling Pit 17. Fuel was pumped into an underground tank which overflowed. The spilled fuel was flushed into the ground by the fire department and no recovery was reported. A site visit of this area by the IRP inspection team revealed no evidence of soil contamination.

- On 24 July 1975, a 250-gallon JP-4 fuel spill occurred behind Hangar 1011 due to an inoperative starter switch resulting in an overflow of an underground storage tank. The spilled material was flushed into the storm drainage system and the oil skimming pond by the fire department.

- On 2 December 1976, a 359-gallon JP-4 fuel spill occurred at Building 159 due to an overflow at the No. 5 tank. The spill was dispersed by the base fire department using approximately 5,000 gallons of water. While the 1976 report suggests that some grass may be killed as a result of this disposal, there was no evidence in 1984 of any dead or stressed vegetation or any stained soils.

- On 9 February 1984, three bowsers at Building 1003 were improperly drained resulting in a spill of 500-gallons of JP-4. According to

Table 4.5

FUEL SPILLS AT FAIRCHILD AIR FORCE BASE
(JP-4, unless otherwise noted)

Date	Quantity (gals)	Location
2 Apr 1984	80	Bldg. 1001
9 Feb 1984	≥500*	Bldg. 1003
12 Jan 1984	50**	Industrial Lagoons via storm system
Unknown, between 1983 and 1984	100* (est)	Pit 18
19 Dec 1983	50	Stub 95
28 Oct 1983	5	Stub 94
3 Aug 1983	2	Stub 8
3 Aug 1983	4-5	Stub 8
3 Aug 1983	53.2	Pit 19
3 Aug 1983	1	Stub 6
3 Aug 1983	2	Bldg. 1013
3 Aug 1983	10	Bldg. 2035
3 Aug 1983	4	Stub 4
26 Jul 1983	25	Bldg. 159
26 Jul 1983	6-7	Stub 8
22 Jul 1983	0.5	Stub 2
11 Jun 1983	4	Stub 4
10 Jun 1983	5	Pumphouse #3
5 Jun 1983	Class I	Unknown
4 Jun 1983	1	Stub 3
2 Dec 1976	359	Bldg. 159
24 Jul 1975	250	Bldg. 1011
15 Apr 1975	50	Stub 5
7 Mar 1975	100	Bldg. 159
23 Jan 1975	2,000	Bldg. 1021
22 Jan 1974	278	Bldg. 159

*100 gallons or greater, HARM ranking required.
**Oil spilled.
Source: USAF Pollution Incident Reports

the Incident Report, the fire department responded and washed down the spill with 5,700 gallons of water and 10 gallons of foam. There was no report of whether or not any fuel was recovered or if there was any impact on surface or groundwaters. Spilled fuels were flushed to the storm sewer system.

- A JP-4 fuel spill occurred in Pit 18 as a result of a ruptured seal in the spring of 1984. The Incident Report for this spill was not seen by the IRP team, but the circumstances of the spill were described by the Liquid Fuels Maintenance Shop and the Airfield Manager. An unknown amount of fuel was lost when it was determined that there were some cracks in the 6,000 gallon underground holding tank. It is estimated that 98 percent of the tank's capacity was recovered. Thus it is possible that the total JP-4 spill was 120 gallons or less. The leaking fuel is believed to have flowed into the storm drainage system ultimately reaching the oil skimming ponds.

Spills occurring in the same area are treated as a single site while all spills that were washed into the storm drainage system will be considered in the evaluation of the industrial waste lagoons. The following spill site descriptions present the rational for the selection of these sites for HARM ranking. Appendix J presents the HARM worksheets for each of these sites.

Site PS-1, POL Bulk Storage Tanks

Fuel sludges from the POL bulk storage tanks (including leaded AVGAS fuels from the 1950s) were weathered in the tank farm area (see Figure 4.3). The soil stabilization system on the floor of the diked areas where the sludges are weathered are severely eroded potentially permitting access to groundwater (Photo A, Appendix G). Groundwater is estimated to be from five to 10 feet below the surface, and native soils are relatively permeable sandy silts underlain by sands and gravels. Further justification for a HARM ranking is the allegation of fully contaminated soils in the POL bulk storage area as well as the fuel odors in the soils detected by the IRP inspection team. Based on this potential for groundwater contamination, a HARM ranking is required.

Site PS-2, Refueling Pits #18 and #19

The quantity of JP-4 that leaked from the tank at Pit 18 is estimated to be less than 120 gallons. A POL product, presumably JP-4, was encountered on top

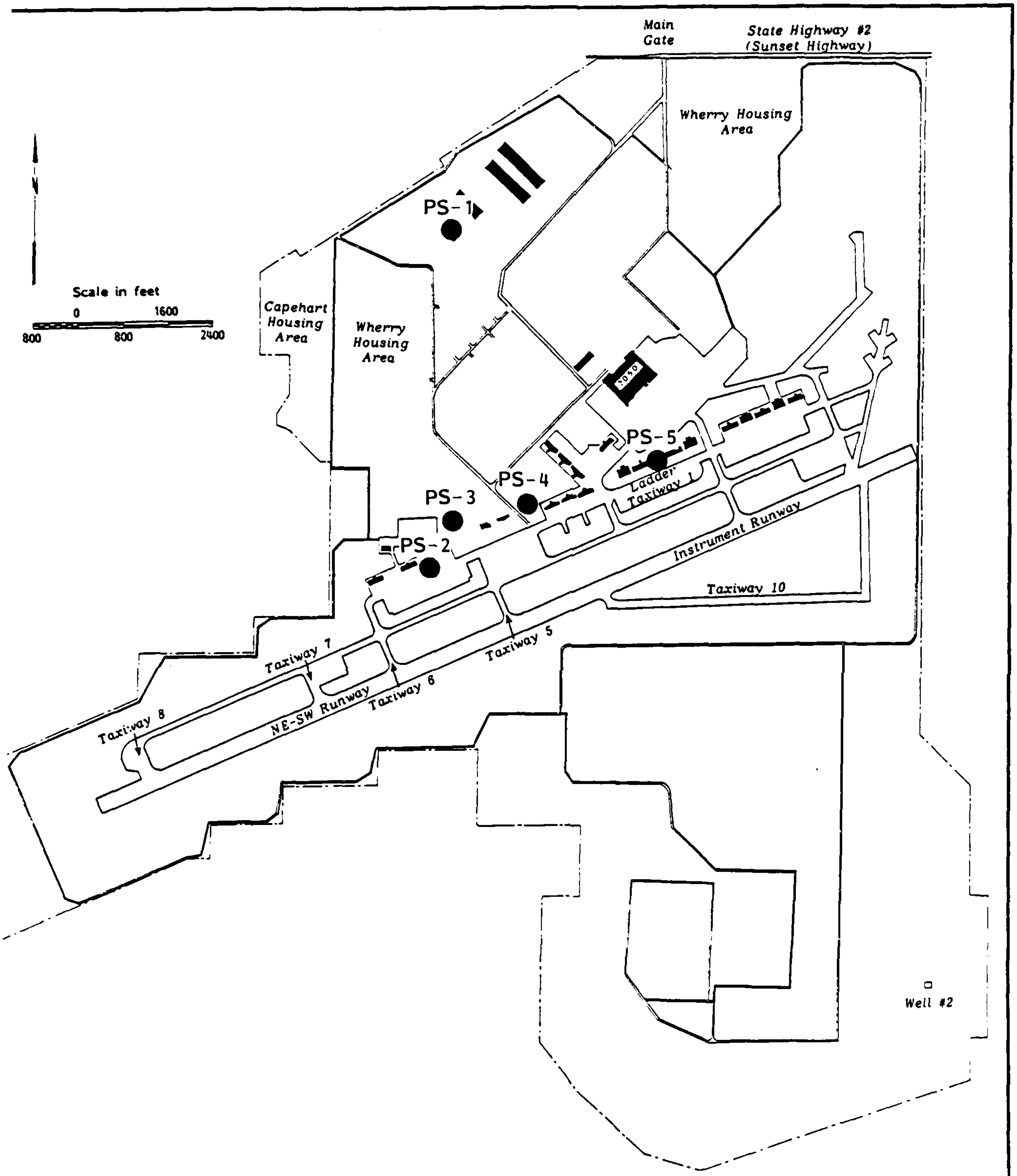

Figure 4.3

POL SPILL SITES PS-1 THROUGH PS-5
(100 GALLONS OR GREATER)
FAIRCHILD AIR FORCE BASE, WASHINGTON

of the groundwater table by the Army COE during flightline foundation drilling. Groundwater was reported at five feet below ground surface. Base soil borings of this area indicate native soils are permeable as they are composed of poorly graded gravel, sands, and silty sands. The total extent of contamination is unknown. Based on observed contamination, a HARM ranking is required.

Site PS-3, Area C Pumphouse Refueling

Three spills of approximately 760 gallons of JP-4 occurred within three years in this location. Spilled fuels were flushed into the ground by the base fire department. The spill report from the 2 December 1976 event suggested some vegetation may have been killed as a result. POL tank sludges and bottoms were also stockpiled here to weather. This area is neither lined nor paved. Depth to groundwater in this area is estimated to be five to 20 feet from the surface. Native soils are composed of permeable silts, sands, and gravels. Based on the potential for soils and groundwater contamination, a HARM ranking is required.

Site PS-4, Pumphouse B

The amount of AVGAS spilled at this location as a consequence of the B-36 crash is unknown. However, estimates by several retirees place the total figure in the thousands of gallons. AVGAS is a leaded fuel and therefore a toxic material. Groundwater levels in the location of this spill are from 10 to 20 feet, and native soils are composed of fine silts and silty sands. Groundwater occurs in sand and gravel layers which are reported to be underlain by a hard, sandy clay (U.S. COE, 6/83; Testhole 83-PA-76 and 83-PA-79). Based on the potential for groundwater contamination, a HARM ranking is required.

Site PS-5, Flightline Fuel Spills

Three JP-4 spills totalling as much as 2,750 gallons occurred near the flightline in the vicinity of Buildings 1003, 1011, and 1021 in a period of nine years. The base fire department flushed these spills into the storm drainage system which is designed to convey spills to the industrial waste lagoons located southeast of the runway. A lined skimming lagoon and holding pond

usually provide a detention time in excess of 50 days. Treatment of petroleum wastes occurs by physical separation and, to a limited extent, faculative biodegradation processes. Since the area in which these spills occurred is paved and all wastes were directed to the industrial lagoons, there appears to be little potential for ground or surface water contamination in the vicinity of the spills. The practice of removing waste petroleum sludges from the industrial lagoons for weathering and disposal does require a HARM ranking. Further information pertaining to these lagoons and their maintenance is included in Section 4.2.4.

4.2.3 Solid Waste Disposal

Seven areas on Fairchild Air Force Base are alleged to have been landfills, waste burial dumpsites, burning or incineration locations, or bulk waste disposal areas. Two locations are radioactive disposal sites. It is likely that industrial wastes were disposed in some of these areas based on interviews with current and retired Fairchild AFB staff. Figure 4.4 presents the reported locations of all of these disposal sites including those that received a HARM ranking. The rationale for the HARM ranking is included with each site description and the HARM worksheet is included in Appendix J.

Site SW-1, Base Landfill Northeast of Taxiway 8

Landfill SW-1 is located northeast of Taxiway Number 8 near the western end of the runway and flightline area. It was approximately 10 acres in size, although a portion of it is now covered by the flight line. The true depth of this site is unknown but probably within the range of 10 to 20 feet. Corps of Engineers' records indicate groundwater is within eight feet of the ground surface at a point 2,000 feet east of Site SW-1. Based on this information, it is probable that groundwater could be within 10 feet from the bottom of the landfill when accounting for differences in topographic elevation. Native soils are composed of sandy silts and poorly graded sands and gravels. This landfill was the main base disposal area from approximately 1949 until 1957 or 1958 when the runway was lengthened and wastes were taken to the Craig Road landfill (Site SW-8). A rather large mound is still visible in this area and is reportedly covered waste material. As this site was stated to be the major base landfill, interviewees familiar with past base operations reported that

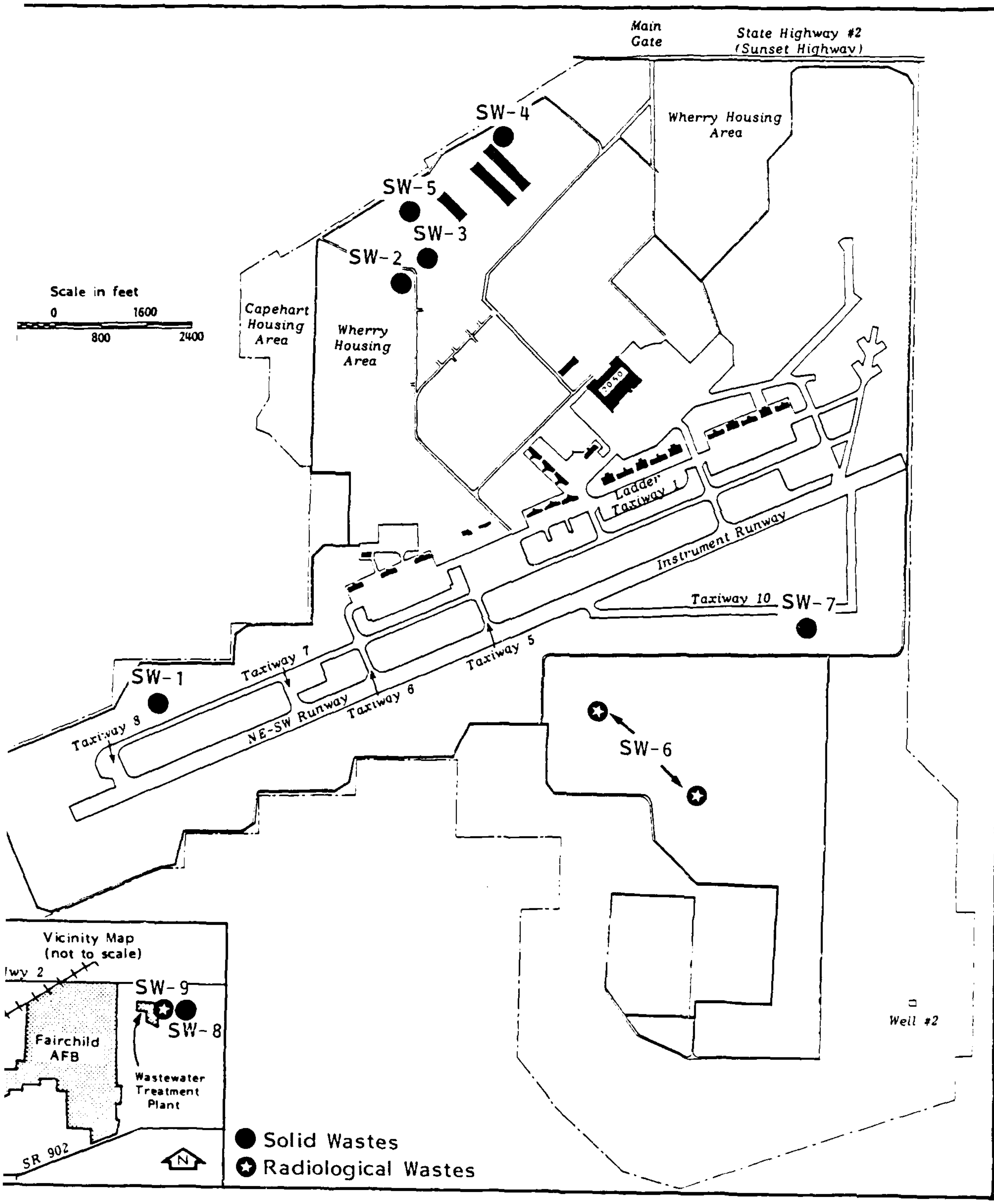

Figure 4.4

SOLID AND RADIOLOGICAL WASTE DISPOSAL SITES SW 1 THROUGH SW-9
FAIRCHILD AIR FORCE BASE, WASHINGTON

r leaks. Underground lines convey JP-4 from the storage tank to the air-aft mock-up located less than 100 feet away. JP-4 is applied to the mock-up four permanent sprinklers located inside the bermed area so that fire ghters do not have to handle the JP-4.

ıe current fire training area was constructed in the early 1970s and all base .re training exercises have been conducted at this site since that time. 'ior to 1970, fire training was conducted in approximately the same area but : that time it was reportedly unlined. The fire department conducts exer-:ses approximately two or three times per month. The frequency has been ıirly constant since the early to mid-1970s due to local regulations to main-ıin air quality standards.

ıly clean JP-4 or that which is contaminated only with water is used for fire raining purposes. The POL fuels lab is responsible for testing all waste uels to confirm their purity prior to delivering them to fire department olding tanks. Approximately 300 gallons of JP-4 is used to ignite each fire nd approximately 125 gallons of aqueous film forming foam (AFFF) is required o extinguish each fire. Excess fuel, water, and AFFF within the bermed area s collected in a catch basin and flows to a fuel separator which is located ust outside the gravel area. The fuel separator is a two-compartment struc-ure with a total capacity of approximately 7,500 gallons. The first compart-ent is approximately three times the size of the second compartment. At the ime of the IRP Phase I inspection, the separator contained approximately 1.5 eet of solids accumulation and did not appear to be operating properly. Due o the intermittent operation of the separator, fuel was able to enter the econd compartment when the water level dropped. Approximately three inches f fuel was floating on the water surface in both compartments. Although here was no discharge of fuel at the time of this inspection, fuel-stained nd dead vegetation within the drainage area of the discharge port was bserved. The escape of fuel separator contents may pose contamination risks o both ground and surface water supplies. Evidence of dead and stressed egetation seem to support this risk potential. Soil borings taken of the area o the southwest (<1,000 feet) indicate native soils are composed of silts, ands, and poorly graded gravel (USAF Master Plan, 1969, Boring Nos. 153-160). roundwater is estimated to be five to 10 feet below ground surface. Based on he potential for environmental contamination, a HARM ranking is required.

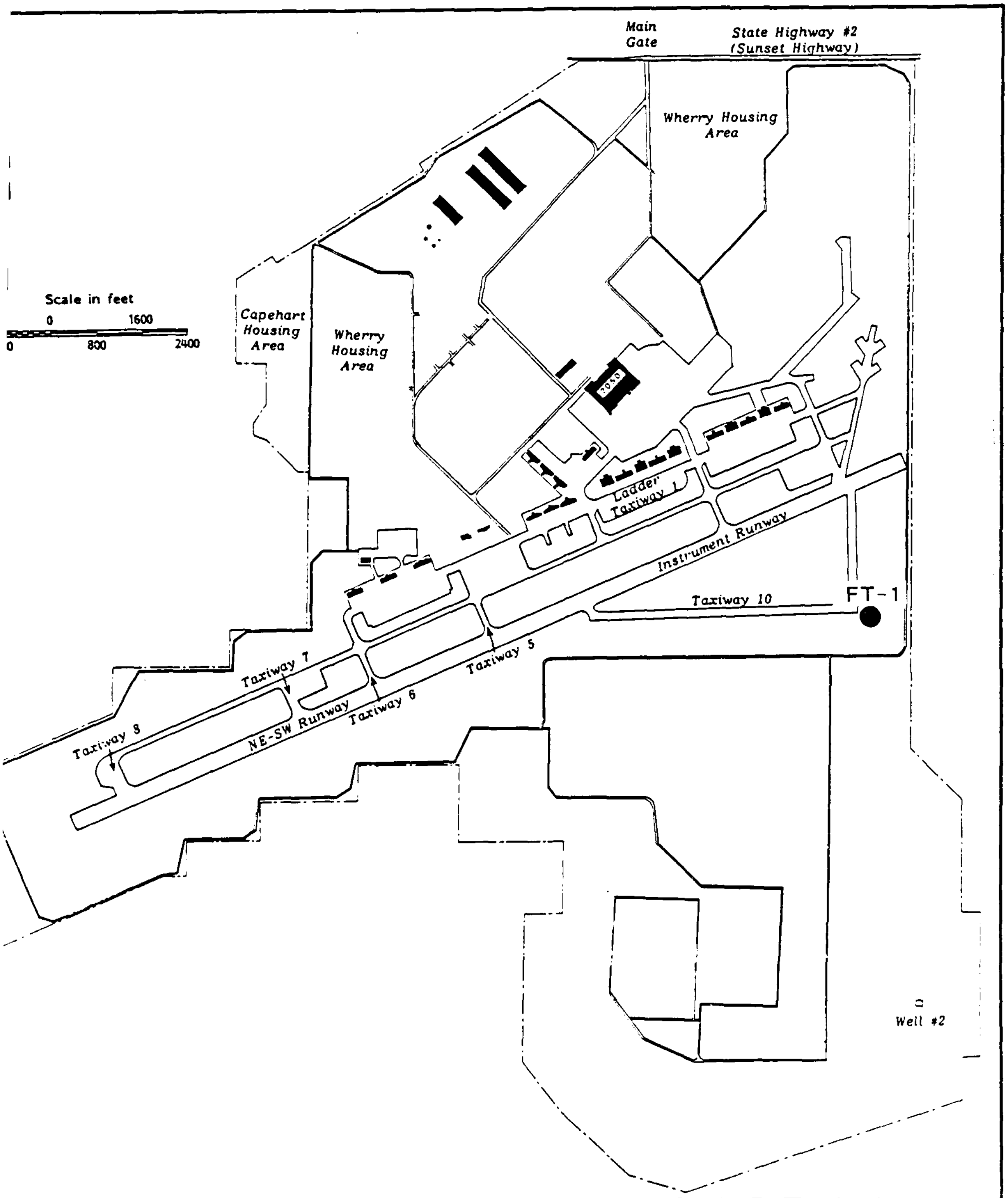

Figure 4.7

FIRE TRAINING SITE FT-1
FAIRCHILD AIR FORCE BASE, WASHINGTON

use but discontinued this practice when complaints were received resulting from the improper application in residential areas.

Effluent quality is good with the five-day biochemical oxygen demand (BOD_5) averaging between 15 and 25 mg/l and total suspended solids (TSS) ranging between three and 15 mg/l. Influent BOD ranges between 130 and 200, with an overall treatment efficiency of approximately 86 percent. Influent TSS ranges between 150 and 220, resulting in an overall removal of 90 percent. It is reported that the effluent BOD_5 concentration may be artificially high due to nitrification caused by the high recirculation rate over the second-stage trickling filter. A Hach kit containing an NO_3 inhibitor has been ordered by the plant foreman to eliminate this interference in the BOD_5 test.

The treatment plant is provided continuous staffing seven days a week. Preventive maintenance is practiced at the plant; all basins and structures are dewatered, inspected, and repaired if necessary. Grounds maintenance and general housekeeping is very good. The treatment plant staff is responsible for the maintenance of the lift stations and the oil/water separators. The collection system and the grease traps are maintained by the plumbing shop.

Based on the condition of the sewage treatment plant as well as on the quality of effluent, a HARM ranking is not necessary.

4.2.5 Fire Training

Fire training exercises at Fairchild AFB occur in one area, Site FT-1, which is located on the east side of the base at the east end of Taxiway No. 10 (Figure 4.7). A gravel area approximately 250 feet in diameter is kept clear of vegetation. Within this circular area is a concrete building for structural fire exercises and an aircraft mock-up for aircraft fire exercises. The aircraft mock-up is encompassed by a small berm of sand and gravel, approximately 60 feet in diameter.

An underground holding tank is located at the fire training area for storage of water-contaminated JP-4. The holding tank has a capacity of approximately 5,000 gallons. It is unknown if this tank has ever been tested or inspected

to the digester daily. Primary effluent crests V-notch weirs around the periphery of the primary clarifiers and flows by gravity to the first-stage wet well. Primary effluent is combined with the recirculated flow and pumped over two rock media trickling filters operating in parallel. Each filter is 60 feet in diameter and has three feet of media. Water distribution across the filters was uniform and the media biomass had good color and appeared healthy. Filter effluent flows into the second-stage wet well and is pumped across two 60-foot diameter second stage trickling filters operating in parallel. The second-stage rock-media filters were also receiving a uniform water distribution and had a good media growth. The recirculation rate for both the first and the second-stage filters is approximately 400 percent.

Effluent from the second-stage filters flows by gravity to two final clarifiers operating in parallel. Each clarifier is 60 feet in diameter with a sidewater depth of 10.5 feet. Accumulation of settled solids from these units is minimal and is wasted directly to the headworks. Secondary effluent crests V-notch weirs around the periphery of the clarifier and flows by gravity to an exfiltration lagoon located approximately 400 feet southeast of the treatment plant.

An EP (extration procedure) Toxicity Test was performed on plant sludges and the results indicate that concentrations of pesticides and metals are below detection limits. Although no such monitoring has been done on the plant effluent, the concentrations of pesticides and metals are expected to be less than that of the sludge. There is the potential for some of these pollutants to pass through the treatment plant and into the ground via the exfiltration lagoon; however, the quantities are believed to be small. The reader is referred to Section 7.0 of this report for recommended monitoring of the wastewater treatment plant effluent.

Primary sludge and scum is stabilized in a two-stage anaerobic digester. The digester is a single structure with the first stage unit mounted on top of the second stage unit. The digester has a diameter of 60 feet with first and second-stage capacities of 222,067 gallons and 190,341 gallons, respectively. Digested sludge is dried on drying beds then landfilled at Marshall landfill. For a short time, the Air Force was stockpiling dried sludge for residential

The existing treatment plant was designed by the company of Bebb Jones Lincoln and Buillon in September 1942, and was constructed in the mid-1940s. Upgrades to the plant facilities include the construction of an exfiltration lagoon in the early 1970s for the disposal of the secondary effluent, and the installation of mechanical grit removal facilities in 1978. Prior to construction of the exfiltration lagoon, effluent was discharged to a subsurface drainfield.

Raw wastewater is conveyed to the treatment plant headworks via a 30-inch gravity interceptor. Grit and sand settles in the influent channel and is mechanically removed by augers that convey it to a dumpster. Dewatered grit is buried in the Marshall landfill. Influent wastewater flow is measured with a Parshall flume prior to the settled solids return stream from the secondary clarifiers. Wastewater passes through two communitors in parallel with a bar screen bypass channel. It was observed at the time of the IRP inspection that the influent wastewater had an oil sheen. It was reported that this was typical, and, although cleaned weekly, the influent grit channel and the primary clarifiers had approximately one-half inch of oil and grease buildup. It was also reported that the treatment plant receives shock loads from the base activities. Most are of a POL nature, but occasionally excess detergents, cleaning solvents, and other industrial substances are discharged into the sanitary sewers. Most industrial shops have oil/water separators to remove POL substances from their wastewaters, but these facilities are occasionally hydraulically overloaded by washing activities. Since the oil/water separators are not shown on either the sanitary or the storm sewer as-built drawings, there is some uncertainty as to which collection system individual shops are discharging. It is believed that both systems do receive some industrial wastewater. However, it was reported that treatment upsets at the plant are minimal due to the reserve capacity of the plant and the high recirculation rate which provides an additional factor of safety.

Degritted wastewater is diverted into two primary clarifiers operated in parallel. Each clarifier is 60 feet in diameter with a sidewater depth of 10.5 feet. Sludge is collected by rotating rake arms then transferred to the anaerobic digester. Sludge pumps are operated by a timer set at 20-minute intervals. Approximately 3,000 to 3,500 gallons of primary sludge is pumped

The cleaning frequency of these lagoons is not documented. There are reports that a petroleum sludge composed of past spill products and straw, the latter used as a sorbent material, covers the bottom. The Pavements and Grounds Shop personnel reported that they have cleaned these ponds at least twice. Cleaning activities consist of blocking the inlet, draining the ponds, and spreading the accumulated sludges on unlined lagoon banks primarily in the southwest area. A covering of 18 or more inches of sludge has been spread along the lagoon banks. Soil borings of this area were not depicted in the base master plan drawings. It is assumed that they are composed of sandy silts or poorly graded sands and gravels as is common throughout this region. The practice of sludge disposal or weathering in the vicinity of the industrial lagoons may pose soils contamination from waste substances, particularly heavy metals. Based on this, a HARM ranking is required.

Site WW-2, Sanitary Wastewater Treatment Plant

Fairchild Air Force Base operates two wastewater treatment facilities. The main plant is a 1.5 million gallon per day (MGD) two-stage rock media trickling filter plant with a two-stage anaerobic digester. Daily flows average 0.8 to 1.0 million gallons, with peak flows of 2.5 MGD during the spring snow melt. The treatment plant provides service for all base facilities except the Geiger Field housing area whose wastes are transported to the Spokane regional treatment facilities. Origins of the wastewaters include residential wastewaters from the Wherry and Capehart family housing units; institutional wastes from the 55-bed base hospital; and some industrial wastewaters from the maintenance shops on the base. The sanitary sewers are reportedly 100 percent separate from the storm sewers. Perhaps due in part to the age of the collection lines, however, infiltration and inflow (I/I) is a problem during the spring snow melt. The sewer system was constructed in the early 1940s and consists of concrete pipe and vetrified clay pipe collection lines and three lift stations.

Geiger Heights, which is a property of Fairchild near the Spokane International Airport, has a two-cell, non-overflow lagoon system which provides wastewater treatment for a community of approximately 400 residents. This plant receives only residential wastewater and is therefore not considered to contain significant quantities of hazardous substances.

National Pollutant Discharge Elimination System (NPDES). The discharge permit (WA002554-2), regulates effluent quality for iron, lead, manganese, biochemical oxygen demand (BOD), suspended solids, visible foam, pH, oil/grease, and methylene blue active substances (MBAS). There have been no major permit violations and only one minor violation (pH) which occurred in April of 1982 (B. Bechtel, EPA, pers. comm, 1984). The NPDES permit does not at this time regulate any of the priority pollutants other than lead. Surface contaminants skimmed from this pond are directed through a concrete channel to the second lagoon which is approximately 450 feet long by 150 feet wide and approximately eight feet deep. A detention time in excess of 50 days in the industrial lagoons allows for removal of pollutants by physical processes. To a lesser degree, biodegradation of organic wastes by aerobic and/or facultative microorganisms occurs in these lagoons. Waste products are held in this evaporative pond and prevented from entering the first lagoon's outfall which enters a natural drainage channel and an unnamed intermittent stream east of Rambo Road. This stream is reported by the Bioenvironmental Engineer to be a water supply for livestock and irrigation. During the IRP Phase I site visit of the industrial waste lagoons, oil-stained soils and vegetation were observed at the lagoon's outfall.

Daily quantities of industrial and runoff wastewaters directed through this system are estimated to be approximately 100,000 gallons. The lagoons occupy approximately eight acres and have a combined capacity of 15,200,000 gallons. The lagoons are reportedly lined with bentonite. Sources of this wastewater are reported to include surface and storm drainage and wastewaters from some oil/water separators which are located in various industrial shop areas throughout the base. Based on old Civil Engineering records and interviews, it is reported that at one time all base oil/water separators discharged to the storm drainage system. However, it was also reported that several separators have since been replumbed to discharge into the sanitary sewer lines. There is no information available from the Civil Engineering Branch indicating the current discharge points of all base oil/water separators, although the current Master Planning activities are attempting to rectify this situation. Some industrial shops are still discharging process wastewaters into the storm drainage system. Flightline area fuel spills are also flushed into storm drains. All of these wastes are carried to the skimming lagoon and holding pond.

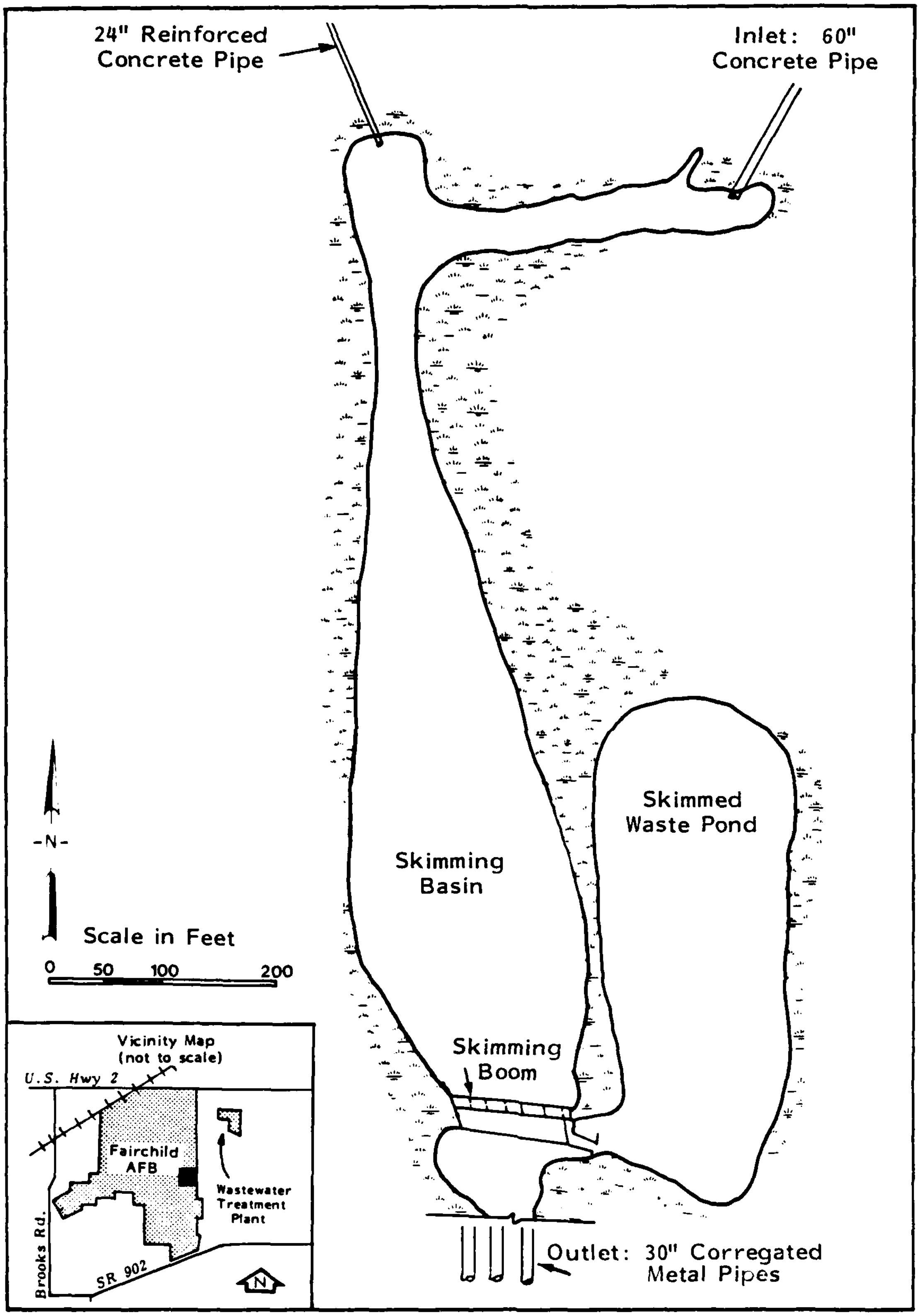

Figure 4.6

INDUSTRIAL WASTE LAGOONS
FAIRCHILD AIR FORCE BASE, WASHINGTON

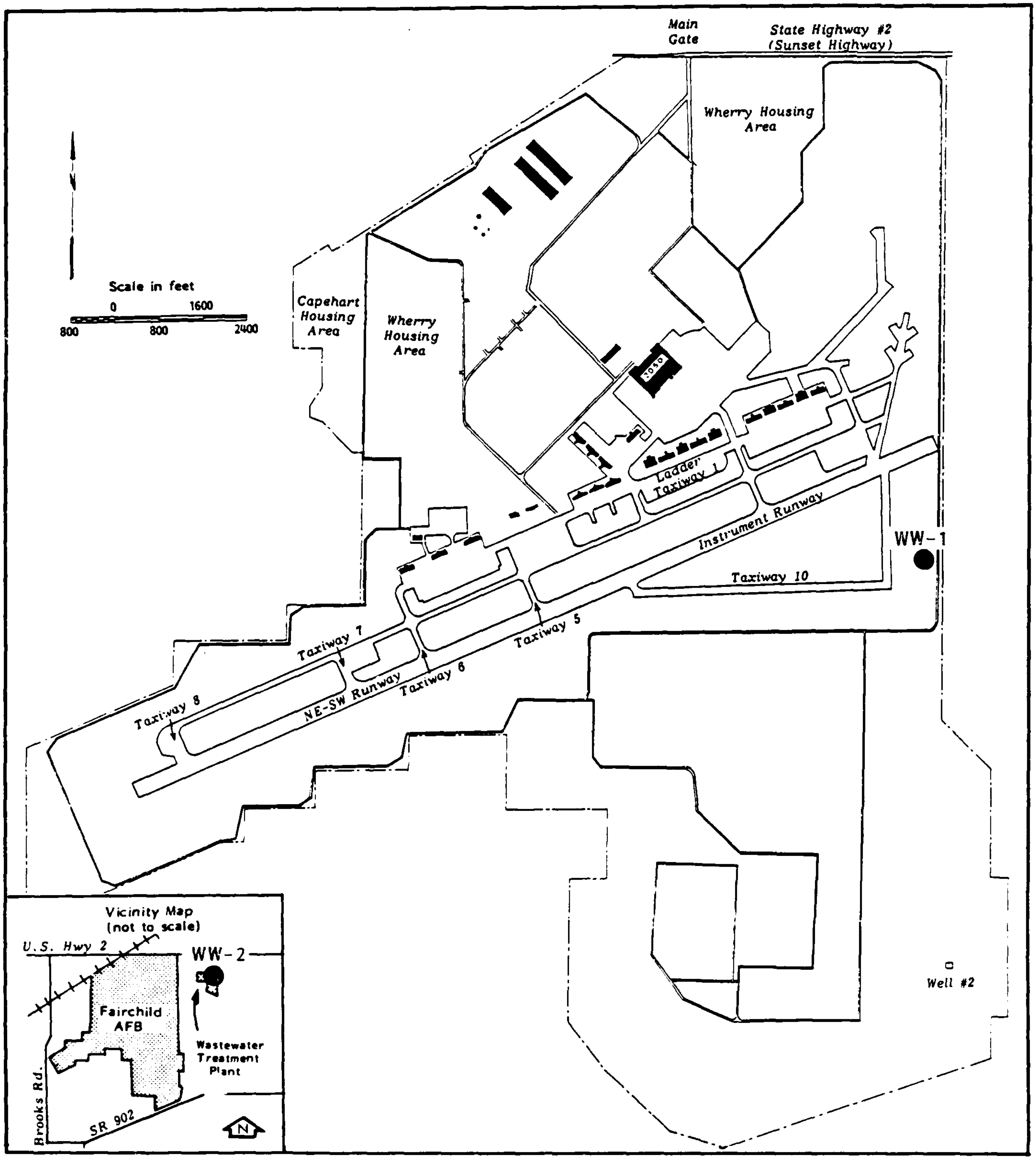

Figure 4.5

WASTEWATER TREATMENT SITES WW-1 AND WW-2
FAIRCHILD AIR FORCE BASE, WASHINGTON

confirmed that such wastes were disposed in this manner. While its exact location is unknown, this borehole is located generally northeast of the main entrance to the wastewater treatment plant. The IRP inspection team visited this area and did not see any fencing, posting, or specific landmarks to delineate its precise location. The site accepted wastes for approximately 10 to 12 years beginning in 1956-57. This burial method is belived to have been and is now an accepted practice for containment of medical wastes containing low grade radioactive properties. Therefore, it is doubtful that human health and environmental contamination risks exist at this site. As with the Deep Creek AFS site, no HARM ranking is required.

4.2.4 Wastewater Treatment

There are two independent wastewater collection and treatment systems serving Fairchild AFB: the industrial waste lagoons, and the wastewater treatment plant. Figure 4.5 presents the locations of these treatment sites. The industrial waste lagoons treat storm runoff collected in a series of open ditches, concrete storm drains, and collection systems found in the south, southeast, and northeast portions of the base. Storm drainage from the family housing sections is collected along curbs and in gutters and diverted to the ditches and drains. Runoff from the shops, hangars, and the flightline area including the runways and parking aprons is also collected in storm drains and ditches and is diverted to the industrial lagoons. The sanitary sewer system collects wastewaters from the housing, hospital, and industrial areas and directs these wastewaters to the treatment plant. Industrial wastes containing hazardous materials are discharged to both collection systems.

Site WW-1, Industrial Waste Lagoons

Also referred to as the industrial and storm weir, this facility is located northeast of the Deep Creek area and west of the Patrol Road. It consists of two interconnected ponds (Figure 4.6): a skimming lagoon and a separate holding pond. The skimming lagoon has a length of approximately 900 feet and varies in width from 30 feet to 200 feet with a spur (400 feet in length) on its northeast bank. This pond is estimated to be six to 10 feet deep, and serves as a large collection lagoon with a skimming boom at its discharge point. The discharge from this system is currently permitted under the

According to many of the retired interviewees, several types of industrial wastes were disposed at this landfill and were not ordinarily recycled like waste motor oils. These materials may have been disposed until the mid-1970s when RCRA regulations and a better awareness of proper waste disposal methods were implemented. The Spokane County Health Department reports that Fairchild AFB had a waste disposal account with the Colbert Landfill for disposal of liquid chemicals (primarily solvents) from approximately the mid-70s until 1980 (J. Anicetti, pers. comm., 1984). This coincides with the time that DPDO assumed disposal of this hazardous waste. It is conceivable that prior to the Colbert contract, these types of wastes may have also been buried in the Craig Road landfill. There are no written records, however, that confirm the presence of hazardous materials either on site or attributable to it. Currently the facility may still be used for construction or demolition debris such as concrete and soils but not asphalt (Photo B, Appendix G). There is a significant amount of debris at this site which is presently not buried.

When the Craig Road landfill was active, wastes were picked up by trucks or loaders from dumpsters located throughout the base. This material was buried in trenches at the landfill. Effluent water from the drainfield of the wastewater treatment plant was reportedly diverted onto the landfill which is located south of the existing effluent disposal lagoon in order to facilitate compaction of waste materials. This past practice may be a cause for concern if hazardous materials were disposed in the landfill since the additional water could serve to mobilize pollutants and promote contaminant migration into the shallow groundwater aquifer which is estimated to be approximately five to 15 feet below the bottom of the landfill. The water surface elevation of the small pond the south of the landfill appears to support this estimate of depth to the water table. There are no foundation test holes near this site to enable a specific soils description. In general, the area's soils are characterized as sandy silts and sands, gravels, and clay originating from glacial outwash. Based on the potential for groundwater contamination and past alleged disposal practices, HARM scoring is required.

Site SW-9, Radioactive Waste Disposal at Wastewater Treatment Plant

A second radioactive disposal site was reported in which hospital materials and vacuum radar tubes were disposed in a cased borehole. The base hospital

desired, of the dry waste disposal trenches should be undertaken, possibly through both the USAF and the Atomic Energy Commission Archives in Washington D.C.

Site SW-7, Waste Disposal South of Taxiway 10

Waste Disposal SW-7 is located south of Taxiway 10. This site is reportedly the disposal area for demolition debris of the 1958 runway reconstruction project. Approximately 200,000 cubic feet of asphalt was placed in this general area to serve as a protective berm for the jet engine test cell. There are no other records or reports that indicate that any additional materials were disposed here. This material is used in conjunction with the test cell activities, although it does not contribute hazardous material or pose risks to the environment as such. However, the reader should refer to the jet engine test cell (Site IS-4) HARM ranking for appropriate results which include this general location.

Site SW-8, Base Landfill at Craig Road

Landfill SW-8 is located east of the main base property on Craig Road and south of U.S. Route 2. It is approximately 26 acres in size and is situated just east of the Fairchild AFB wastewater treatment plant. This landfill was the principal base disposal area from approximately 1957/58 until the late 1970s. During the period of its operation, the landfill is alleged to have been used for disposal of sanitary refuse, demolition or construction debris, and industrial wastes. Based on these types of wastes, it is assumed that the depth of this landfill is from 10 to 20 feet. When the landfill closed, the base redirected its sanitary refuse wastes to the Marshall landfill which is operated by Spokane County.

Some of the retirees interviewed recalled that materials such as cleaners and solvents, some in quantities of 50 gallons per year, were disposed in this site. Filters from dry cleaning, fuel line filters, and transformers may have also been disposed here. A report prepared for EPA Region X states that approximately 180 gallons per year of paints and thinners were also dumped at this site (Battelle, 1975).

historian suggest coal storage in the years 1952, 1969, and 1975. The use of the area as a construction burial site probably coincided with the conversion of the steam plant to natural gas in the 1960's. There are no records or information indicating any industrial wastes or hazardous materials were ever disposed in this area. Based on this, HARM scoring is not required.

Site SW-5, Incinerator at DPDO Yard

Site SW-5 was reported by several retirees to be the location of an incinerator. Some interviewees reported classified materials were burned, while others claim that only general base sanitary wastes were destroyed. The total disposal area is unknown but the site was located in the DPDO storage yard northwest of the POL bulk storage tanks. The incinerator is believed to have been in operation during the 1940s, closed sometime during the late 1940s or early 1950s, and then reinstated in the mid-1950s for burning plastic and other wastes. All burning at this site was discontinued by the early 1960s. There are no records or indications that hazardous materials were disposed or burned at this location. Based on this, HARM ranking is not required.

Site SW-6, Radioactive Waste Disposal at Deep Creek AFS

The southeast portion of Fairchild AFB, formerly known as Deep Creek AFS and now as the weapons or munitions storage area, was an Atomic Energy Commission facility during the late 1940s and 1950s. Two liquid tanks (1,000-gallon and 5,000-gallon) for waste wash waters and dry waste such as clothing were buried in two trenches. One retiree that served as a liaison with the Deep Creek operations recalls that some wastes were sealed and transported for burial at sea. Wastewater analyses of the liquid wastes was performed by the USAF Radiological Health Laboratory at Wright-Patterson AFB in 1971. Results from this analysis were reported to be negative with the conclusion that disposal of this material could be directed to the existing wastewater collection system if desired. It is doubtful that any human health or environmental contamination risks exist as confirmed by the results of this testing and because the wastes are isolated within a fenced area. Radioactive wastes are not covered under RCRA regulations. Based on this it is unsuitable to undertake a HARM ranking. It is recommended, however, that the area containing the dry wastes remain fenced and posted. Further investigation, if

all wastes ended up at this location including industrial waste materials, plating sludges, waste solvents and oils, cutting oils and shavings, dry cleaning filters and spent filtrates, paint wastes, and ash from the coal burning steam plant. The site was also alleged to be a burning dump although this was not confirmed by all interviewees. Based on the past alleged disposal practices and potential for groundwater contamination, HARM scoring is required.

Site SW-2, Waste Disposal Northeast Corner of Wherry

Waste Disposal SW-2 is located in the northeast corner of the Wherry housing development along Dakota, Pennsylvania, and Michigan Streets. This site was originally a lumber storage area before being converted to housing. Some retirees recall that the area may have been used for demolition wastes disposal while others dispute that claim and report that its only function was lumber storage. It was also an area of high groundwater and drainage problems that proved to be a problem when the housing units were constructed during the late 1940s and early 1950s. Dewatering of this site prior to residential construction seems likely, although there are no records confirming such activities. There are no records or information suggesting that any hazardous waste materials were ever disposed here. HARM scoring therefore is not required.

Site SW-3, Waste Disposal Southwest of POL Bulk Storage Tanks

Waste Disposal SW-3 is situated west-southwest of the POL bulk storage tanks and east of Offutt Drive. This site comprises approximately five acres and was reportedly used only for demolition debris in the early or mid-1960s. There are no records or information indicating any industrial wastes or hazardous materials were ever disposed in this area. Based on this, HARM scoring is not required.

Site SW-4, Waste Disposal North of Building 2451

Waste Disposal SW-4 is located north of Buildings 2451 and 2452. This site initially was a coal tipple, the place where coal was loaded to supply the steam plant and, at a later date, reportedly became a disposal site for construction and demolition debris and trash. The precise range of dates that this area stored coal is unknown, although air photos obtained from the base

5.0 OFF-BASE FACILITIES

5.1 FAIRCHILD PROPERTIES REVIEW

A records search of off-base facilities and interviews with site personnel was conducted by the IRP Phase I inspection team in addition to the information gathered for Fairchild AFB proper. These investigations were conducted to determine the likelihood or potential for hazardous wastes presence based on past activities at these sites. Helicopter overflights were arranged for the IRP team to observe the sites and the overall environment in order to better evaluate the potential, if any, for contaminant migration and potential pathways or targets. A brief description of each of the off-base sites in this phase of the IRP investigation is presented below. Figure 5.1 presents the location of off-base sites within the Fairchild AFB/Spokane area, and Figure 5.2 portrays the location of the more distant Mica Peak and Cusick sites.

- Fort George Wright Cemetary and the Fairchild AFB water supply well field are located adjacent to the Spokane River and Riverside State Park in the west Spokane area. This water annex is comprised of three deep water wells and is located approximately eight miles from Fairchild AFB.

- Fort George Wright helicopter assault pad is a helicopter training site located approximately eight miles from Fairchild AFB.

- Site 07, a satellite tracking facility, is located approximately six miles north-northeast of the base.

- Cusick Site, a 90,000 acre forested parcel, is located approximately 60 miles north of the base off Highway 395. This facility is utilized for survival training and as such is located on remote, undeveloped land. Approximately 40 acres on site is developed for receiving supplies and processing of personnel.

- Geiger Heights, a housing facility, is located approximately seven miles southeast of the base south of Interstate 90 and the Spokane International Airport.

- Cheney Housing, an annex to the Fairchild family housing, is located approximately eight miles south of Fairchild AFB in the City of Cheney. This site is approximately five acres in size, with 16 Air Force housing units. Water, sewer, and solid waste service is provided by the City of Cheney.

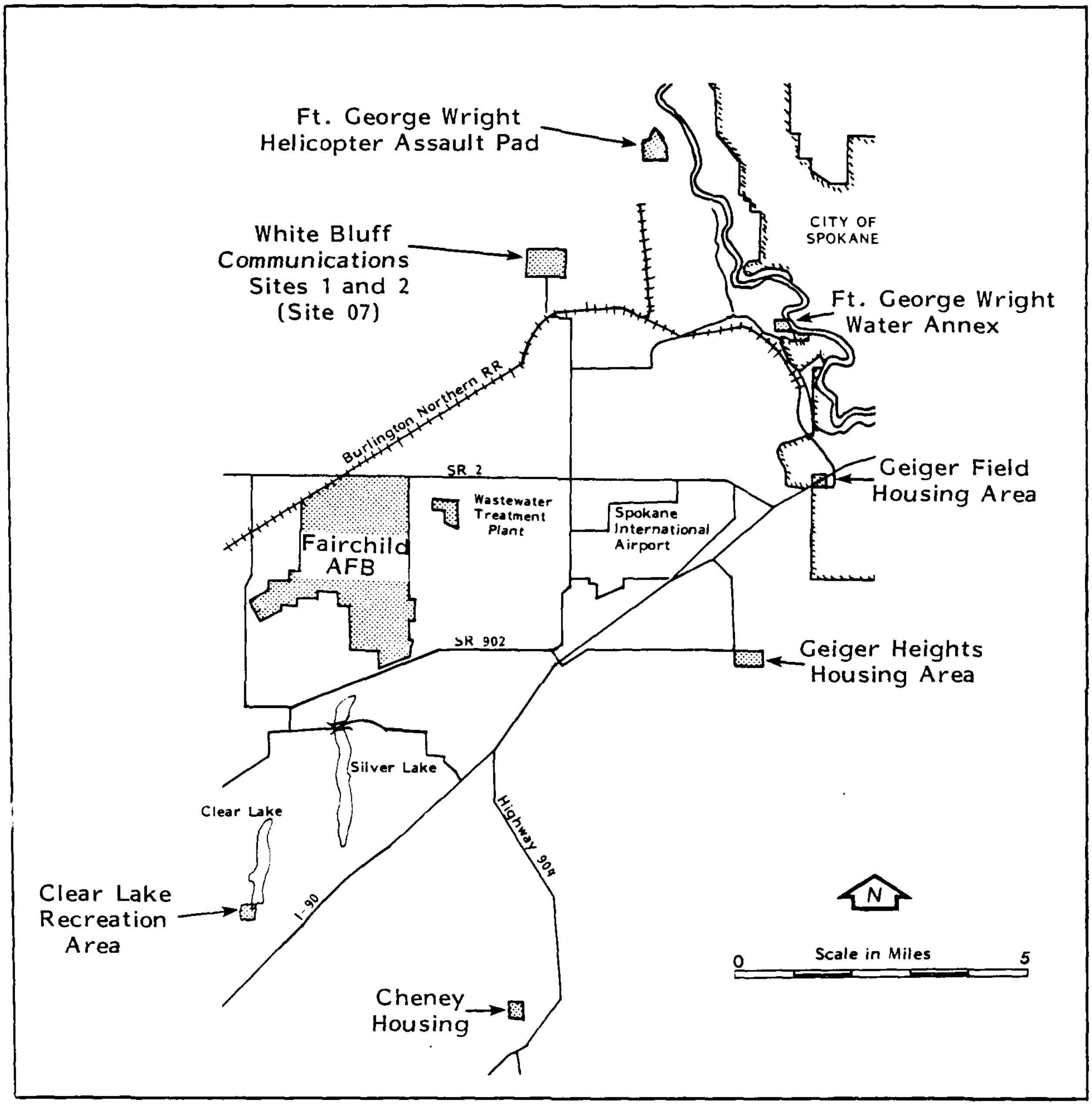

Figure 5.1

AIR FORCE OWNED OFF-BASE FACILITIES
FAIRCHILD AIR FORCE BASE, WASHINGTON

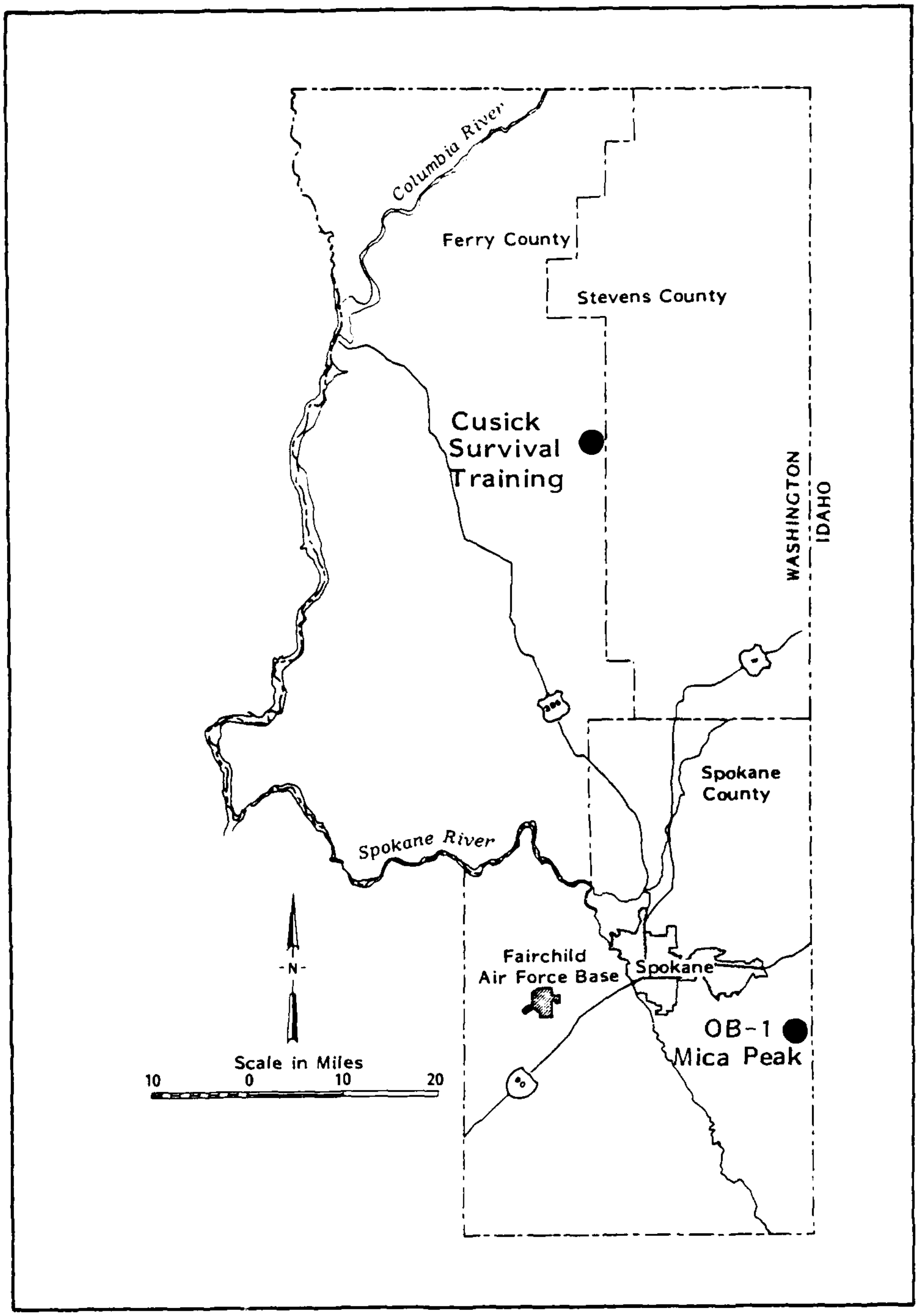

Figure 5.2

AIR FORCE OWNED OFF-BASE FACILITIES BEYOND
A TWENTY-MILE RADIUS FROM
FAIRCHILD AIR FORCE BASE, WASHINGTON

- Mica Peak is a jointly managed (FAA/USAF) regional long range radar facility and aircraft control station. This facility is almost 30 miles east of the base on top of Mica Peak (elevation 5,206 feet).

- Several hundred "Cold Wand" sites are located around the base on privately owned property. Each site hosts propane tanks which are used to precipitate cold fog into snow and enable continued aircraft operations during inclement weather.

- Many navigational aid sites are located from one to five miles from the base.

- Clear Lake recreation area is an Air Force-owned campground on the southeast corner of Clear Lake. This site is approximately 33 acres in size and located approximately seven miles south of Fairchild AFB. Services at the campground include a pavillion with a snack bar, six cabins, eight recreational vehicle camping sites with electrical hookup only, a covered picnic area, and a small boat motor maintenance building. Sanitary wastes from the pavillion are treated by a septic tank and drainfield system. The septic tank is located 30 feet from the lakeshore. This is less than the minimum set-back of 100 feet now required by the State of Washington Department of Social and Health Services. The septic tank was installed in 1973, which was prior to the adoption of the lakeshore set-back requirements. The septic tank is inspected regularly and pumped as necessary. Potable water is supplied by a groundwater well. No solvents are used at this site. Small quantities of oil are used for minor motor maintenance. There is one MOGAS tank on-site with a capacity of approximately 1,300 gallons. There have been no reports of waste disposal problems at Clear Lake recreation area.

Based on information gathered during the IRP Phase I investigation, only the Mica Peak site was determined to have a potential problem based on accounts of past waste generation and disposal activities. Neither Fort George Wright nor the Cold Wand fog dispersal units use hazardous materials or generate hazardous wastes. Cusick generates waste oils, but these are returned to the base and handled through DPDO. Site 07 uses fuels, oils and solvents in small quantities. Fuels and solvents are reported as being used in process, with no wastes generated. Waste oils are stored on-site in 55-gallon drums and returned to the base for disposal through DPDO. Therefore, waste disposal practices at Cusick and Site 07 do not present environmental problems. All other properties have no records indicating any hazardous waste storage or improper disposal practices.

5.2 MICA PEAK

Mica Peak, the longrange radar detection facility, has many transformers and capacitors associated with both Air Force and FAA equipment. This station has been in operation since approximately 1959. FAA employees indicate that standard operating procedures require the scheduled testing and subsequent changing when necessary of transformer, capacitor, and antenna oils. Staff, familiar with this facility since its opening, report oil is changed yearly and estimate the waste quantities to be at least 50 gallons per year. The 50-gallon figure is a minimum waste quantity based on the annual replacement of dielectric oils in two 17-gallon capacity and two 12-gallon capacity transformers located in the FAA facility. During the late 1950s and throughout the 1960s, waste oils were disposed outside the building in either the septic drainfield or on the ground surface around the building and near doorways. There are more transformers and equipment that use dielectric material at this facility, and disposal of this matter was reportedly the same. Based on the dates of operation as well as the popularity and reliability of polychlorinated biphenyls (PCBs) in transformer oils, it is possible that some of the waste oils discharged on the ground surface contained PCB contaminants at unknown concentrations. Waste cleaning solvents including carbon tetrachloride were also dumped in these locations.

At the present time, there are approximately 25 people that work at the Mica Peak facility. All sanitary wastewater is discharged to a septic tank and drainfield system. It is unknown if the septic tank has ever been pumped out. A spring located approximately 500 feet downhill of the radar installation is the source of drinking water for the site. While it is unknown if any on-site contamination is present, the downslope location of the water source may be susceptible to contamination caused by surface activities on top of the peak. There has been no known water quality monitoring of the Mica Peak water supply to confirm or deny the presence of organic contaminants from the maintenance activities involving the transformers or fecal contamination from inadequate sewage treatment. Based on the past practices of oil and solvent disposal on site, a HARM ranking is required.

6.0 CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is the potential for adverse environmental impact resulting from past and present waste management and disposal practices, and to assess the probability of contaminant migration from these sites. The conclusions in this section are based on an evaluation of the information collected during site inspections; interviews with local, state, and federal government employees and present and retired base personnel; record and file searches; and review of the environmental setting as it applies to the identified waste disposal sites.

6.1 GENERAL CONCLUSIONS

1. Information obtained through the examination of USAF records, interviews with past and present base personnel, and outside agency records searches indicates that the base activities of primary concern involve the waste generation and disposal of hazardous materials by the industrial shops; the POL bulk storage facilities and POL spills; and solid waste disposal sites and wastewater treatment facilities.

2. Interviews with retired Fairchild AFB personnel indicated that improper disposal of hazardous substances occurred in the past, including disposal of organic solvents into storm and sanitary sewers, dumping transformer oils which possibly contained PCBs onto the ground at Mica Peak, and washing of spilled fuels into the soils. Most retired interviewees agreed that unknown quantities of waste paint, thinners, solvents, and other materials were disposed in the base landfills.

3. Most industrial shops are equipped with oil/water separators on their flow drain systems. Quantities of hazardous materials being discharged to the separators can be estimated based on interviews and records from the Bioenvironmental Engineer's office. Table 4.4 (presented in Section 4.0) indicates which materials are discharged to the sanitary/storm drains of each shop. Because oil/water separators are not located on either the sanitary sewer or the storm drainage as-built drawings, it is unclear to

which collection system each separator discharges. This makes it difficult, if not impossible, to quantify the amounts of hazardous materials that are ultimately discharged to each system.

4. Generally, most hazardous materials at Fairchild AFB are currently being handled appropriately. Waste oils and waste fuels are recycled. Waste paints, solvents, thinners, paint strippers and PCB-contaminated materials are disposed through DPDO. Generally, small quantities of dilute hazardous substances are discharged to the sanitary and storm collection systems. Photographic chemicals are discharged to the sanitary system while small quantities of materials such as acetone, methanol, and ethyl acetate may be discharged to either system. Significant quantities of PD-680 from shop washing activities are also discharged to these systems.

5. The POL bulk storage tanks are contained behind asphalt covered berms. Many of the berms are cracked and corroded. It is uncertain if these berms would provide adequate confinement in the event of fuel spills due to their condition. Bulk storage tank sludges are allowed to air weather within this diked area, but the cracked asphalt bottom probably does not provide adequate barrier against the migration of fuel into the underlying soil. With groundwater levels between five and 10 feet, the potential for groundwater contamination exists. These dikes are scheduled to be sealed with gunite to improve their protective capabilities.

6. The wastewater treatment plant is well maintained and operated, and provides good wastewater treatment. There is a concern, however, for the plant effluent entering the ground from the exfiltration lagoon. This effluent stream could cause migration of pollutants contained in the base landfill at Craig Road (Site SW-8).

6.2 HARM RATING AND PRIORITY SITE DESCRIPTION

Twenty-one potential contamination sites were identified at Fairchild Air Force Base and one additional waste disposal site was identified at the USAF-owned but USAF/FAA-operated Mica Peak communications site. Twelve of these sites were ranked using the Air Force Hazard Assessment Rating Methodology (HARM). These sites and their respective scores are presented in

Table 6.1. There are a few selected rating factors in the HARM model to which the Fairchild sites are sensitive. In all on-base site rankings, the land use received maximum scoring due to residential areas adjacent to the base. Population served by groundwater also received the maximum score since all on-base sites are within three miles of Well 2A, which is part of the base water supply system. Other factors which resulted in elevated HARM ratings for most sites were the distance to base reservation, the high groundwater levels, and the distance to nearest surface water.

The HARM scores ranged from 71 to 40 with several sites receiving scores between 59 and 64. Figure 6.1 identifies the locations of the 11 on-base sites and the one off-base site, Site OB-1. A discussion of each site is presented below beginning with the highest ranked site and proceeding in descending order of HARM score. Recommendations and Best Management Practices (BMPs) for the continued use or cleanup of these sites is presented in Section 7.0.

Site WW-1, Industrial Waste Lagoon

Based on its HARM score, Site WW-1 poses the most significant potential for environmental contamination at Fairchild AFB. This is a result of the weathering of bottom sludges on the banks of the lagoon. Due to the quantities of waste fuels, industrial process wastewaters, and other types of hazardous substances that are discharged to the storm sewers, there is the potential for these materials and their components to accumulate in the sludge. The practice of sludge disposal allows the sludge drainage to percolate into the soils adjacent to the lagoon presenting the potential for contamination of soils and groundwater. The industrial lagoon is reportedly lined with clay, but banks are not lined. Groundwater level is relatively shallow, between five and 10 feet beneath the site. Oil-stained soils and vegetation were observed around the sides of the lagoon. The industrial lagoon discharges to an unnamed ditch which flows through a farmer's field and is used for livestock watering and agricultural irrigation. Due to the potential for soils, surface water, and groundwater contamination and the proximity of the industrial lagoons to the base boundary, Site WW-1 received a HARM score of 71.

Table 6.1

PRIORITY HARM RANKING OF DISPOSAL SITES
FAIRCHILD AIR FORCE BASE, WASHINGTON

Site Number	Site Name	HARM Score
WW-1	Industrial Waste Lagoon	71
FT-1	Fire Training Area	70
SW-1	Base Landfill NE of Taxiway #8	64
PS-3	Area C - Pumphouse Fueling	64
SW-8	Base Landfill at Craig Road	63
PS-4	Pumphouse B	61
OB-1	OLAA 25 ADS Mica Peak JSS	60
PS-2	Refueling Pits #18 and #19	59
PS-1	POL Bulk Storage Tanks	53
IS-1	Building 1034 French Drain	52
IS-4	Jet Engine Test Cell	47
IS-3	Building 2150, Reciprocating Engine Test Cell	40

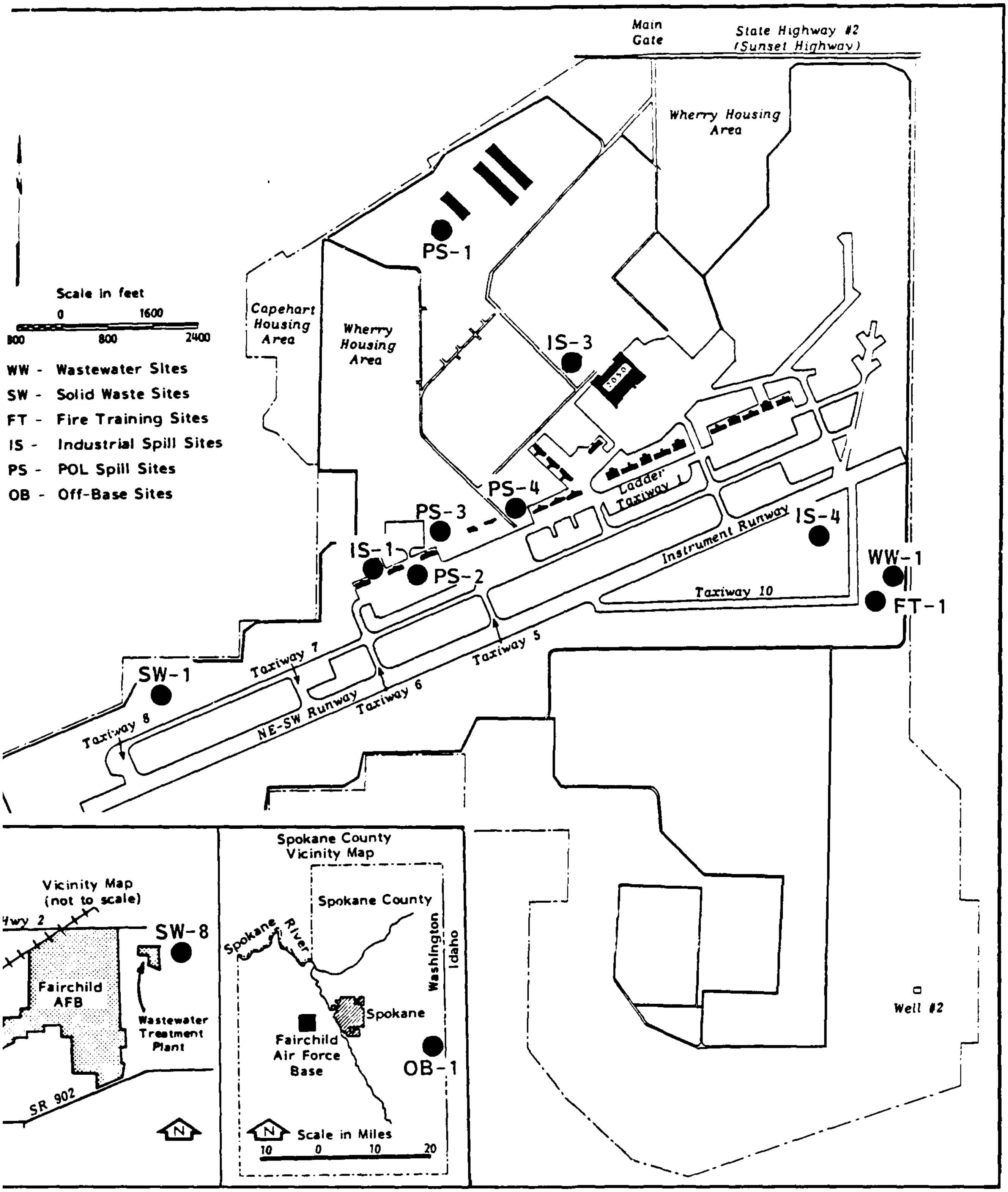

Figure 6.1

LOCATION OF SITES RANKED BY HARM METHODOLOGY
FAIRCHILD AIR FORCE BASE, WASHINGTON

Site FT-1, Fire Training Area

A potential for surface water contamination exists at site FT-1. Unburned fuel, Halon, and AFFF from fire training activities is collected in an oil/water separator. At the time of the IRP site inspection, the water level in the separator was so low as to allow the lighter fraction wastes to enter the final compartment. When the separator fills with water, this floating waste will escape from the separator and be discharged to surface waters. Evidence of past discharges was observed by the presence of oil stained and dead vegetation near the drain channel from the separator. The present burn pit is reported to have a clay liner, but the waste JP-4 tank is not lined, and its structural integrity is uncertain. Furthermore, past exercises may have occurred over an unlined area. The groundwater table at this site is estimated to be five to 10 feet below ground surface, and the soils are mostly sands and gravels. As a consequence, there is potential for both surface and groundwater contamination. Site FT-1 received a HARM score of 70.

Site SW-1, Base Landfill Northeast Taxiway 8

There is a potential for groundwater contamination at Site SW-1 due primarily to the shallow groundwater depth and the relatively permeable soils. A potential exists for migration of any persistent compounds since this was an alleged disposal site for significant quantities of solvents, paints, thinners and other chemicals. Additionally, this landfill is situated near the installation boundary, which increases a concern for the potential off-base migration of contaminants. Site SW-1 received a HARM score of 64.

Site PS-3, Area C Pumphouse Fueling

The potential for groundwater contamination exists at Site PS-3 due to the chronic spillage of JP-4 during fueling and defueling operations. The groundwater level at this site is between five and 20 feet below ground surface. Local soils are chiefly permeable sands and gravels. Therefore, the potential is significant for contaminant release to groundwater in the event of spills. Site PS-3 received a HARM score of 64.

ite SW-8, Base Landfill at Craig Road

he potential for both groundwater and surface water contamination exists at ite SW-8. Depth to groundwater is from five to 15 feet and the soils are ıostly sands and gravels, but do contain some clay. It is estimated that the andfill is excavated to depths of 15 to 20 feet which would place the bottom ıf the landfill below groundwater level during some periods of the year.

'otential for migration of the persistant compounds exists since this was an ılleged disposal site for significant quantities of solvents, thinners, ›aints, and other chemicals. Depending on the nature of these wastes, the ›otential for mobilization via surface water runoff exists. This site is located off-base and is in relatively close proximity to a small lake and to ›rivate citizens' properties. Currently demolition waste and other debris remains uncovered. Site SW-8 received a HARM score of 63.

Site PS-4, Pumphouse B

The potential for environmental contamination exists at Site PS-4. Groundwater quality may be threatened due to the large quantity of AVGAS spilled at this site and the presence of permeable soils in the area which provide little or no protection against contaminant migration. Since AVGAS contains lead, the potential for persistent metals residue is present. Site PS-4 received a HARM score of 61.

Site OB-1, OLAA 25 ADS Mica Peak Joint Surveillance Station

The potential for contamination of groundwater and surface water supplies exists at Site OB-1 from the past practice of dumping used electrical equipment oils which may have contained PCB contaminants. Distance to the nearest water supplies are approximately 500 vertical feet from this site, and the personnel at the radar facilities as well as individuals downgradient are dependent on those supplies for a potable water source. Although this waste oil disposal practice ended in the late 1960's a potential risk may remain since PCB's are known to be very persistent in the environment. Site OB-1 received a HARM score of 60.

ite PS-2, Refueling Pits #18 and #19

ontamination of groundwater with POL was observed at Site PS-2, although the ull spatial extent of this contamination is unknown. Since POL product has eached groundwater, the potential exists for its migration away from the ite. Soils in this area are predominantly sands and gravels and the groundater level was reported at five feet below the ground surface. Characterisics of the soil and depth to groundwater enhance the potential for contamiant migration. Site PS-2 received a HARM score of 59.

ite PS-1, POL Bulk Storage Tanks

he potential for groundwater and soils contamination exists at site PS-1. roundwater is between five and 10 feet, and the soils in this area are ermeable. Only limited protection is provided by the berms due to their poor ondition. Bulk storage fuel sludge is currently weathered at this site. hese substances include aromatic hydrocarbons and possibly metal residues. ue to conflicting reports, the IRP investigative team was unable to ascertain he condition of the bulk storage tanks or confirm that tank fuel leaks have ccurred. Site PS-1 received a HARM score of 53.

ite IS-1, Building 1034 French Drain

ite IS-1 is a potential source of environmental contamination due to direct ischarge of waste solvents and acids into the ground via a french drain. The robability of groundwater contamination is increased by the presence of shalow groundwater, less than 10 feet from the ground surface, and permeable oils. Since the french drain is at least five feet deep, it is probable that ome portion of it is occasionally below groundwater during some parts of the ear. Site IS-1 received a HARM score of 52.

ite IS-4, Jet Engine Test Cell

ite IS-4 poses minimal potential for environmental contamination. While roundwater is shallow and the soils in this area are permeable, quantities of aste oil disposed are small. Surface water contamination is also reduced in hat the drainage ditch that carries this waste stream ultimately empties into he base industrial lagoons. Site IS-4 received a HARM score of 47.

e IS-3, Building 2150, Reciprocating Engine Test Cell

potential for environmental contamination at Site IS-3 is considered to be imal from any hazardous wastes or materials that may be found within this lding. It was reported, however, that all underground lines and tanks ving this facility may not have been properly pickled. Because of this, lines and tanks that were not identified for protection may have been king fuel during the last several years. Because groundwater levels are atively shallow, there is a potential for groundwater contamination as well for adjacent soils which are comprised primarily of poor to well graded ıds and silts. Site IS-3 received a HARM score of 40.

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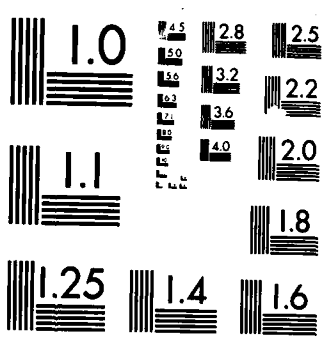


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

7.0 RECOMMENDATIONS

The recommendations presented in this section and summarized in Table 7.1 are remedial measures which need to be implemented to further assess the potential for environmental contamination from past activities at Fairchild Air Force Base, to eliminate the sources of continuing or future releases of contaminants, and to generally improve the solid and liquid waste management practices at the base. The recommendations which are presented include those which are specific to one or more waste disposal sites previously identified through HARM ranking and those general best management practices which should be instituted base-wide. The recommendations also consider future land use restrictions which are applicable to the sites. Table 7.2 presents a description of guidelines used in identifying restrictions to future land use.

7.1 WASTE DISPOSAL SITE RECOMMENDATIONS

Site WW-1, Industrial Waste Lagoons

It is recommended that the industrial waste lagoons be drained and the solids removed. At this time their clay liners should be inspected and, if necessary, new liners should be installed to cover the bottom of the lagoons as well as their banks. It is recommended that the skimming lagoon and holding pond sludges be sampled and analyzed for at least the heavy metals, pesticides, chlorinated hydrocarbons, and aromatic hydrocarbons. Lagoon sludges should be weathered on an impermeable surface. Dewatered and weathered sludges should be permanently disposed in accordance with state and federal regulations. Future land use is restricted by the existing industrial waste lagoon.

Site FT-1, Fire Training Area

There is evidence that waste fuel has been escaping from the fuel separator at Site FT-1. It is recommended that this structure be inspected regularly, and that prior to fire training activities, all light fraction wastes should be pumped from the separator. The condition of the underground waste JP-4 storage tank is unknown. This tank should be pressure tested to determine if there is any leakage. This is of particular importance since the burn pit's

Table 7.1

SUMMARY OF RECOMMENDATIONS

Site ID	Site Description	General Recommendations	Sample Analysis	Land Use Restrictions
WW-1	Industrial Waste Lagoons	Inspect liners, replace if necessary. Drain and remove solids at regular intervals.	Sludge analyzed for heavy metals, pesticides, chlorinated hydrocarbons.	Restricted to current use.
FT-1	Fire Training Area	Pressure test the waste JP-4 tank. Extend clay liner around/underneath the waste JP-4 tank. Keep the light fraction wastes pumped out of the oil/water separator to prevent escapement.	Four to six shallow monitoring wells. Groundwater analysis should include aromatic hydrocarbons, heavy metals, pH, and conductance.	Restricted to current use. Prohibit water supply wells and infiltration areas, recreational use and agricultural use.
SW-1	Base Landfill NE of Taxiway #8	Initiate monitoring program.	TOX, TOC, pH, heavy metals, specific conductance. Four groundwater wells, six to eight groundwater sampling events over one to two years.	Restricted by the runway and clear space.
PS-3	Area C - Pumphouse Fueling	Improve fuel handling to avoid spillage. Initiate monitoring program. Consider soils treatment or removal.	Ten shallow borings analyzed for possible aromatic hydrocarbons, heavy metals; shallow monitoring wells.	Restricted to current use.
SW-8	Base Landfill at Craig Road	Cover and grade construction and demolition waste. Initiate monitoring program.	TOX, TOC, pH, heavy metals, specific conductance. Five groundwater wells, six to eight groundwater sampling events over one to two years.	Restricted to recreational opportunities and limited traffic. Prohibit wells, deep excavations, agricultural and silviculture, building of structures, and water infiltration.
PS-4	Pumphouse B	Environmental monitoring, removal or in-situ treatment of contaminated soils, if necessary.	Three monitoring wells. Soil and groundwater analysis for aromatic hydrocarbons and heavy metals.	Restricted by location within the industrial area.
OB-1	OLAA 25 ADS Mica Peak JSS	Monitor soil and water supply for PCB contamination, remove soils, if necessary.	Six soil borings and 12 PCB analyses in soil matrix. Three water samples from potable water supply over a one-year period.	Restricted to current use. No burning or ignition of sources.
PS-2	Refueling Pits #18 and #19	Improve fuel handling to avoid spillage. Initiate monitoring program. Consider soils treatment or removal.	Three groundwater wells and Civil Engineering borings should be analyzed for aromatic hydrocarbons, specific conductance, and heavy metals, six sampling events over two years.	Restricted to current use. No burning or ignition of sources.
PS-1	POL Bulk Storage Tanks	Monitor soils underneath berms. Continue with plans to spray berms with gunite. Empty tanks and inspect thoroughly, repair if necessary. Dispose of fuel tank sludges in accordance with USAF procedure AFM 85-16.	Four monitoring wells. Soil and groundwater analysis for aromatic hydrocarbons and heavy metals.	Restricted to current use.
IS-1	Building 1034 French Drain	Remove french drain and install a sump pump to lift wastewater to the sanitary sewer.	Two monitoring wells. Groundwater analysis for pH, conductance, TOX and TOC.	Restricted to current use.
IS-4	Jet Engine Test Cell	Improve waste materials handling. Install an oil/water separator.	None	Restricted to current use.
IS-3	Building 2150, Reciprocating Engine Test Cell	Reinspect to locate all underground fuel lines and tanks. Clean up facility, label and properly store all chemical substances.	Four to six shallow monitoring wells. Soil and groundwater analysis for armoatic hydrocarbons and heavy metals.	Restricted to current use.
N/A	Low-Level Rad Waste Site Near Treatment Plant	Fence the site and mark it with an appropriate sign.	None	Restricted to recreational use and limited traffic. Prohibit excavations, wells, agriculture, silviculture, building of structures.
N/A	Oil/Water Separators	Perform dye test to determine to which collection system each separator discharges. Locate each separator on the appropriate as-built drawings.	N/A	Restricted to current use.

Table 7.2

DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the Site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disburbance of the cover or subsurface materials.
Well Construction on or Near the Site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site based on prevailing soil conditions and groundwater flow.
Agricultural Use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural Use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water Infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational Use	Restrict the use of the site for recreational purposes.
Burning or Ignition Sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal Operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular Traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material Storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or Near the Site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

clay liner does not extend around or beneath the waste JP-4 tank. It is recommended that the clay liner be extended around/underneath the waste storage tank. Environmental monitoring of groundwater is recommended based on the potential for soils contamination in this area from either the waste JP-4 storage tank or fire exercise activities prior to 1970 when the burn pit was reportedly unlined. Four to six shallow groundwater monitoring wells should be installed around the margins of the fire training area. Groundwater analyses should include the aromatic hydrocarbons and heavy metals. Specific conductance and pH should be analyzed and used in time series as indicators of contaminant migration. Future land use restrictions should be placed on this site to prevent the construction of any water supply wells, water infiltration areas, or deep excavations.

Site SW-1, Base Landfill Northeast of Taxiway #8

This landfill was abandoned in 1957 or 1958 when the runway was extended. Because this landfill was an alleged disposal site of hazardous materials such as solvents, paints, thinners, strippers, dry cleaning wastes, and other industrial wastes, environmental monitoring is recommended. Groundwater monitoring is necessary to determine if contaminants are migrating from this site. Monitoring wells should be placed as follows: one well upgradient of the landfill, to provide upgradient background data; and three wells downgradient of the landfill. A landfill groundwater monitoring program should include at least six to eight sampling events over a one to two-year period. Sample analyses should include TOC, TOX, pH, heavy metals, and specific conductance. If no measurable impact in the groundwater quality has been observed, monitoring of this site may be discontinued. Future land use of this site is restricted to its present use as the runway and clear space.

Site PS-3, Area C Pumphouse Fueling

Since fuels have been washed into the soils around this site, it is recommended that shallow soil borings be taken to determine the extent, if any, of soil and groundwater contamination. At least 10 three-foot deep soil borings are recommended in the vicinity of suspected soil contamination. These borings should be analyzed for heavy metals and aromatic hydrocarbons. If borings indicate significant contamination, shallow groundwater monitoring

wells may be required. Total number and placement of such wells is dependent upon the extent of contamination as indicated by the soil borings. Soils removal or in-situ treatment should be considered. In-situ treatment of soils may require repeated shallow tilling and seeding to enhance microbial breakdown and volatilization of contaminants. Future restrictions should be placed on the development of water supply wells at this site and activities involving burning or ignition sources.

Site SW-8, Base Landfill at Craig Road

All base sanitary wastes were hauled to this landfill from the years 1957 or 1958 to the late 1970s. There is a considerable amount of construction and demolition wastes that have been disposed at this site over the last several years that remains uncovered. It is recommended that all this material be graded and covered. Because the landfill was an alleged disposal site for hazardous materials such as solvents, paints, thinners, strippers, dry cleaning wastes, and other industrial wastes, environmental monitoring is recommended. The potential for leachate generation and migration of contaminants is of particular concern due to the water being discharged into the ground from the treatment plant's exfiltration lagoon. Groundwater monitoring wells should be placed as follows: one well upgradient of the landfill to provide background data; two wells placed in between the landfill and the exfiltration lagoon, to determine the effects of the landfill on groundwater quality; and two wells downgradient of the exfiltration lagoon, to determine the combined effect on the groundwater from both sources. A groundwater monitoring program should include at least six to eight sampling events over a one to two-year period. Sample analyses should include TOC, TOX, pH, heavy metals, and specific conductance. At that time, if no measurable impact on the groundwater quality has been observed, monitoring of this site may be discontinued. Future land use of this site should be restricted to recreational opportunities and limited traffic use. Wells, deep excavations, agriculture and silviculture, and building of structures should be prohibited. Water infiltration should be minimized.

Site PS-4, Pumphouse B

Thousands of gallons of AVGAS was reportedly spilled when a B-36 crashed at this site in the early 1950s. Potential soil contamination at Site PS-4 exists due to the lead contained in the fuel. Environmental monitoring is recommended to determine the levels of lead or aromatic hydrocarbons remaining at this site. Soil borings should be taken from around the spill site and monitored for lead and aromatic hydrocarbons. Additionally, the groundwater in this area should be monitored for hydrocarbon contamination. A well should be placed upgradient of the spill site to determine background levels and two more wells placed immediately downgradient of the site. Future land use of this site is restricted by its location within the industrial area of the base and proximity to the flightline. The Air Force should consider in-situ treatment or having the soils removed if the soils at this site are determined to be highly contaminated and the potential for leaching of contaminants into the groundwater continues.

Site OB-1, OLAA 25 ADS MicaPeak Joint Surveillance Station

At least 600 gallons of waste oils from electrical and electronic equipment, some of which possibly contained PCBs, was dumped onto the ground at this site. It is recommended that at least six surface soil samples be taken from around the building where waste oils were dumped, and six soil samples taken at a depth of three feet from within the septic tank drainfield to determine if there are any PCB-contaminated soils. If PCB contamination is confirmed, soil borings and additional chemical anlyses should be accomplished to determine the spatial and vertical extent of contamination. Contaminated soils should be removed and disposed in accordance with DPDO rules and regulations. The groundwater supply should be analyzed for PCB content three times over a 12-month period.

Site PS-2, Refueling Pits #18 and #19

It is recommended that Refueling Pits #18 and #19 be inspected and repaired if necessary to prevent potential fuel spills from reaching adjacent soils. Evidence of groundwater contamination has been reported by the Corps of Engineers near Pit #19. Environmental monitoring should be undertaken to determine the full extent of this contamination. Because base Civil

Engineering has reported that they are planning to excavate additional test holes in this area, it is recommended that soil borings and groundwater samples, if available, be collected for analyses. These samples should be analyzed for total aromatic hydrocarbons, specific conductance, and heavy metals content. In addition, a minimum of three shallow groundwater monitoring wells should be installed with at least two of these wells being located downgradient of the affected area. These wells should be sampled at least six times over the next two years for total aromatic hydrocarbons, specific conductance and heavy metals content. Soil removal or in-situ treatment should also be considered in severely contaminated areas. In-situ treatment of soils may require replanted shallow tilling and seeding to enhance microbial breakdown and volatilization of contaminant.

Site PS-1, POL Bulk Storage Tanks

The POL bulk storage tanks are located in the "2400 area," in the northeast portion of the base. The four bulk storage tanks are bermed. However, these berms are in poor condition and the floors inside all four berms are severely cracked. It has been reported by the Chief Environmental Engineer that soils removed during spring 1984 with a posthole digger were observed as being contaminated with fuel. However, the IRP inspection team was not able to have this observation confirmed by other base personnel. An inspection of the bulk storage tanks should be undertaken as soon as is reasonably possible to determine their overall condition and the potential for fuels loss. The Air Force should proceed with their plan to line the berms with gunite to contain any fuel spills. Soil sampling both beneath the POL bulk storage facilities and around the periphery of the berms is recommended prior to gunite spraying to determine the extent, if any, of soils contamination. Shallow monitoring wells should be installed outside of each corner of the POL storage facility. All soil and groundwater samples should be analyzed for aromatic hydrocarbons (using either UV-Fluorescence or GC/MS techniques) and heavy metals. All contaminated soils should be removed prior to gunite sealing. Discontinue the practice of weathering tank bottoms on-site and follow USAF-prescribed procedure AFM 85-16 for handling POL tank sludges.

Site IS-1, Building 1034 French Drain

All water from the floor drain in Building 1034 is conveyed into a french drain which, because of its construction, allows direct discharge of wastewater into the ground and possibly into the groundwater. It is recommended that the french drain be removed and a wet well and small pump be installed to lift wastewater to the sanitary sewer. This will prevent the further discharge of contaminants to the ground from Building 1034 and provide treatment of this waste stream at the wastewater treatment plant. Two shallow groundwater monitoring wells should be placed along this french drain and groundwater sampled and analyzed for TOC, TOX, pH, and specific conductance. Future land use is restricted by the existing Washington Air Guard activities.

Site IS-4, Jet Engine Test Cell

Waste oils have been disposed in an open drainage ditch at Site IS-4. It is recommended that this practice be discontinued and all waste fuels as well as other waste materials be turned into DPDO, recycled, or disposed in an appropriate manner. Installation of an oil/water separator is recommended if oil contaminated washdown materials are commonly flushed into the storm drain/ditch. Due to the small quantities of waste disposed and lack of contamination evidence in the drainage ditch, no sampling is recommended.

Site IS-3, Building 2150, Reciprocating Engine Test Cell

Although this facility has been a storage site for several hazardous substances, including solvents and PCBs, there is no belief that these materials were disposed or spilled outside the facility. It is believed, however, that fuels, may have leaked from underground tanks and lines. It is recommended that efforts be made to locate all underground lines and tanks to confirm those which have been pickled and those which may have been leaking fuel. Four to six shallow monitoring wells should be installed around this facility located along fuel tanks and lines, where possible. Groundwater and soil samples should be analyzed for aromatic hydrocarbons and heavy metals. In the event this facility is demolished, it is recommended that extreme caution is exercised to protect workers from the possible exposure to spilled and residual chemical substances, if present. So long as the Air Force plans to continue to use this facility as a storage area, it is suggested that this

facility be cleaned and all chemical substances properly labeled and stored. Appropriate health and safety apparatus should be utilizd by the cleanup crew.

7.2 BEST MANAGEMENT PRACTICES AND OTHER RECOMMENDATIONS

1. A cased bore hole was placed in the base sanitary landfill near Craig Road and used for disposal of low-level radioactive hospital materials and vacuum tubes. It is recommended that the exact location of this site be confirmed, and that it is fenced, marked with appropriate signs, and recorded on base site drawings.

2. Perform a dye test on the sanitary and the storm water collection systems to determine to which system each oil-water separator is discharging. All separators should then be located on the appropriate as-built drawings. It is also recommended that the inspection schedule of these units be re-examined to insure they are being cleaned as necessary to prevent recoverable hydrocarbons from discharging to the sanitary and the storm collection systems.

3. It was reported that the waste fuel bowsers used by the 92nd OMS are in very poor condition with leaking valves. It is recommended that these bowsers be repaired or replaced to eliminate leakage of waste fuel. (The probability of a spill is greater with this equipment in its current reported condition, as the valves do not close properly.)

4. It is recommended that effluent from the waste water treatment plant be monitored quarterly for total priority pollutants, or at a minimum the heavy metals, and chlorinated and aromatic hydrocarbons.

APPENDICES

APPENDIX A

BIOSKETCHES OF KEY PERSONNEL

- R. Greiling
- P. O'Flaherty
- R. Peshkin
- G. Steiner

RICHARD W. GREILING

EDUCATION

University of Wisconsin, B.S., Industrial Engineering (1973)
University of Wisconsin, M.S., Sanitary Engineering (1975)
University of Wisconsin, M.S., Water Resources Management (1975)
University of Washington, Cold Regions Engineering (1980)

PROFESSIONAL ENGINEERING REGISTRATION

Alaska (CE-4940), Arkansas (CE-5794), Nevada (CE-6569), Washington (CE-17737), and Wisconsin (CE-18130)

PROFESSIONAL EXPERIENCE

Project Manager for site investigations in Phase II of the Installation Restoration Program (IRP) at McChord Air Force Base, Washington. To date the project has resulted in the siting and development of more than 30 groundwater monitoring wells placed at depths up to 250 feet. Geophysical studies have incorporated more than 22,000 linear feet of seismic refraction transects and more than 25 electrical resistivity stations to assist in the geologic interpretation of subterranean impermeable features which may serve as an aquitard between two shallow aquifers, both of which are used for AFB water supply and for public and private water supply in communities adjacent to the AFB. Investigations are continuing to determine the origins of now confirmed hydrocarbon and chemical contaminants, pollutant mobilization and fate, and methodologies to recover or treat the contaminants from the groundwater and the soils.

Project Manager for the performance of RCRA Section 3012 preliminary assessments at 160 potential hazardous waste disposal sites in Washington State. The project entails the records search of local, state and federal regulatory and resource management agencies, on-site surveys, and interviews of owner/operators and adjacent property owners for the purposes of identifying the potential risks associated with past and current hazardous waste management practic s, pollutant mobilization and migration, and environmental and health risks. ranking scores are being developed for numerical rating of all sites, and site information is being assembled and stored in a computerized data ba

Project Manage for IRP Phase II site investigations at Kingsley AFS, Oregon and George AF California. Field investigations include magnetometer surveys across abandon l landfills to determine the location and areal extent of suspected buried c iemical wastes in steel drums, boring and development of groundwater monitoring wells, soil and groundwater chemical characterization, and the testing for exfiltration of industrial waste and flight-line run-off into the groundwater through a 1.5 mile perforated corregated metal interceptor and drain line.

USAF Hospital (HOSP)

Aeromedical Services

Chief Bioenvironmental Engineer, SGPB	2 years

Hospital Services

NCOIC Radiology, SGHR	2 months

Surgical Service

Chief Surgical Service, SGHSA	1 year
NCOIC Surgical Suite, SGHSG	3 years

Medical Logistic Management

Biomedical Equipment Repair Technician, SGLE	3 years

92ND COMBAT SUPPORT GROUP

DISASTER PREPAREDNESS DIVISION

Chief Disaster Preparedness Division*, DW	33 years

MORALE WELFARE AND RECREATION DIVISION

Hobby Shops

Director Arts and Crafts Shop*, SSRC	17 years
Manager Automotive Shop*, SSRV	5 years

OPERATION AND TRAINING DIVISION

Assistant NCOIC Small Arms Training Branch	1 year

92ND CIVIL ENGINEERING SQUADRON (CES)

Engineering/Environmental Planning Branch

Chief Engineer*, DEE	3 years
Chief Environmental and Contract Planner*, DEEV	5 years

Fire Prevention Branch

Assistant Fire Chief*, DEF	13 years

Propulsion Branch	
Chief Propulsion Branch, MAFP	10 months
Assistant Chief Propulsion Branch, MAFP	2 months
NCOIC Non-Powered AGE, MAFP	2 years
NCOIC Test Cell, MAFP	10 months
92nd Munitions Maintenance Squad	
Maintenance Supervision	
NCOIC Analysis, MAWSP	2.5 years
92nd Organizational Maintenance Squad	
Commander, CC	2 years
Inspection Branch	
NCOIC Washrack, MAOI	2 years
Support Branch	
Chief Support Branch, MAOG	8 years
Assistant NCOIC Non-Powered AGE Shop, MAOGA	9 years
Supply Manager, MAOG	6 years
Tanker Branch	
Flight Chief, MAOK	6 years
92nd Supply Squadron	
Fuel Management Branch	
Fuels Management Officer, LGSF	6 months
Material Storage and Distribution Branch	
Chief Inspector Base Supply*, LGSDI	20 years
92nd Transportation Squadron	
Traffic Management Branch	
Traffic Manager*, LGTT	4 years
Vehicle Maintenance Branch	
Superintendent, LGTM	2 years

APPENDIX C

LIST OF INTERVIEWEES

(*denotes civilian employee)

	Period of Service at Fairchild (As of 9/17/84)

92ND BOMB WING HEAVY, BMW

HISTORY DIVISION

BMW Historian, HO	8 months

MAINTENANCE

92nd Avionics Maintenance Squad

Mission Systems Branch

NCOIC Fire Control Shop MAAMD	2 years

92nd Field Maintenance Squad

Aerospace Ground Equipment Branch (AGE)

Chief AGE Branch, MAFG	5 months
Assistant Chief AGE Branch*, MAFG	2 years

Aerospace Systems Branch (ASB)

Chief ASB Branch, MAFA	5 years
Assistant NCOIC Egress Shop, MAFAG	3 years
NCOIC Electrical Systems Shop, MAFAE	3 years
NCOIC Environmental Systems Shop, MAFAV	2 years
NCOIC Fuels Shop, MAFAF	1 year
NCOIC Pneudraulics Shop, MAFAP	1 year
NCOIC Repair and Reclamation Shop, MAFAR	7.5 years

Fabrication Branch

Chief Fabrication Branch, MAFF	6 months
NCOIC Corrosion Control Shop, MAFFC	3 years
NCOIC Machine Shop, MAFFM	2.5 years
NCOIC Non-Destructive Inspection Shop	2.5 years
NCOIC Structural Repair, MAFFS	3 years
NCOIC Survival Equipment, MAFFE	1 year
NCOIC Welding Shop, MAFFP	1 year

APPENDIX C

LIST OF INTERVIEWEES

Tim Nord, Inspector Industrial Division
Department of Ecology, Headquarters
Mail Stop PV-11
Olympia, Washington 99504
(206) 495-6031

James Pankanin, Environmental Engineer
Environmental Services Division
U.S. Environmental Protection Agency, Region X
1200 Sixth Avenue South
Seattle, Washington 98101
(206) 442-8561

Ernest Sabo, Civil Engineer
Foundations and Construction Branch
U.S. Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124
(206) 764-3705

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

John Anicetti, Environmental Health Specialist
Spokane County Health District
West 1101 College Avenue
Spokane, Washington 99201
(509) 456-3630

Barbara Bechtold
EPA/Washington Operations Office
c/o WDOE, PV-11
Olympia, Washington 99504

Jim Bottorff
U.S. Fish and Wildlife Service
Office of Endangered Species
2625 Parkmont Lane
Olympia, Washington 98502
(206) 753-9444

James Holloway, Administrative Assistant to the Mayor
City Airway Heights
Airway Heights, Washington 99001
(509) 244-5578

R. Howard
U.S. Fish and Wildlife Service
Office of Endangered Species
4696 Overland Road
Room 566
Boise, Idaho 83705
(208) 334-1806

Dean Jones, Electrical Technician
Kenneth Wollse, Electrician
OLAA 25 ADS Mica Peak JSS
Federal Aviation Administration

James Malm, Regional Hazardous Waste Supervisor
Roger Ray, District Environmental Quality Supervisor
Washington State Department of Ecology, Eastern Regional Office
East 103 Indiana
Spokane, Washington 99207
(509) 456-2926

Joan McNamee, Chemical Engineer
Superfund Branch
U.S. Environmental Protection Agency, Region X
1200 Sixth Avenue
Seattle, Washington 98101
(206) 442-4903

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

Served as a team member for the IRP Phase I Records Search and Site Investigation at Shemya AFB, Alaska. The project entails records search of sites at the installation and at appropriate Federal and State offices, interviews of key personnel, and field reconnaissance of the installation of all hazardous waste disposal practices, storage locations, and transfer sites. Shemya AFB site survey included intensive examination of the POL system, landfill operations, base industrial shops and power plant, fire training facilities, and chemical/POL spill areas.

Developed a handbook for the Washington State Department of Social and Health Services field staff concerning organic chemicals in public and domestic groundwater supplies titled, "Organic Chemicals in Drinking Water". This document included: a literature search of organic chemicals contamination incidences; treatment methods; a listing of priority pollutants, with descriptions and water limits, when available; and a step by step situation response for identification and response to organic chemicals contamination in potable water supplies.

Developed proposed design specifications for septic tank use for the Washington State Department of Social and Health Services.

Participated in groundwater study of Clallam County to determine sensitivity of local groundwater quality. Results of the study will assist county planners in management of urban development. Key aspects of the study included groundwater quantification and nitrogen mass balancing and migration.

Project Manager of a study on land disposal of fruit and vegetable processing wastewater. Evaluation focused on three processors with wastewater flows between 0.5 and 1 MGD. The land available for wastewater disposal ranged from 50 and 75 acres to 200 acres. Evaluation included hydraulic and pollutant loadings to land and groundwater; operation and maintenance of spray field; and environmental assessments and recommendations.

Served as an Environmental Technician for the Washington State Department of Ecology. Duties included the following: inspection of municipal and industrial waste treatment facilities to determine compliance with NPDES permit; investigation and documentation of environmental complaints and oil spills; inspection and water quality monitoring of solid waste facilities; and technical review of sanitary sewer plans and specifications.

PUBLICATIONS

"Tacoma City Well 12-A: A Statistical Approach to Analysis of Groundwater Contamination". March, 1984. Unpublished paper for Master of Science degree in Civil Engineering, University of Washington.

Diagnostic Evaluation Report of Wastewater Treatment Facilities in EPA Regions V and VI (8 reports) by JRB Associates, August 1983-1984.

GLYNDA JEAN STEINER

EDUCATION

University of Washington, B.S., Civil Engineering, March 1982
University of Washington, M.S., Civil Engineering, June, 1984

ENGINEERING CERTIFICATION

Engineer-in-Training (Washington)

PROFESSIONAL EXPERIENCE

Serves as inspector in a nationwide contract calling for diagnostic evaluations and technical assistance to publicly owned treatment works (POTW) which have failed to achieve or presently are in noncompliance with the NPDES wastewater discharge limitations. The plant investigations are focusing on industrial and municipal wastewater characterization, unit process performance and operations flexibility, process control, plant operations and maintenance, and operator staffing levels and training needs.

Developed municipal NPDES discharge permits with 301(h) variances for EPA Region IX. Plant design capacities ranged from 12 MGD to 120 MGD and included primary and secondary facilities. Technical assessments included development of an intensive monitoring program for both the wastewater and the receiving environment; and determination of effluent limits based on initial dilution of ocean water. These permits are among the first to be issued in EPA Region IX.

Project Manager of a contract to update the NPDES effluent data in the PCS (Permit Compliance System) for EPA Region X. Responsibilities included establishment of a coding format for effluent NPDES effluent limits as they apply to permittees in Region X, correction of existing data base to be consistent with the aforementioned format, data entry, and PCS troubleshooting for the Region. Quality control and data accuracy was provided by retrieval and verification of entered data.

Serves as a project team member for the performance of preliminary assessments of 160 potential hazardous waste storage and disposal sites in Washington State in accordance with Section 3012 of the Resource Conservation and Recovery Act. Project assignments include record searches; site surveys; and interviews of owners/operators of storage and disposal sites and adjacent property owners for the purpose of identifying and summarizing the potential risks from these operations. Technical assessments include determination of mobilization and migration of contaminants from these hazardous waste sites and the evaluation of the potential environmental and public health impacts resulting from these activities.

Serves as an integral team member in hazardous waste monitoring activities in accordance with U.S. Air Force Installation Restoration Program (IRP) at McChord, Washington and George, California. Field assignments included monitoring well installation, multiple well development techniques, groundwater sampling and water quality analysis.

Self employed geologist providing interpretive services at oil and gas exploration drill sites. Examined and analyzed rock cuttings for hydrocarbon content through a series of physical and chemical field techniques. Supervised and instructed junior geologists in hydrocarbon detection and analysis. Prepared stratigraphic sections and cuttings logs. Correlated geophysical logs with cuttings logs to determine upper and lower limits of permeable or producing formations.

Research scientist aboard R/V Eastward involved in a marine geochemical paleoclimatic study. Mr. Peshkin was responsible for deep marine sediment collection and analyses of sediment physical/chemical properties, and collection and interpretation of geophysical data. He interpreted paleoclimatic events through correlation of carbonate content of sediments and seismic reflection data.

Computer operator and monitor for a financial data processing firm. Technical responsibilities incorporated a variety of data base management skills such as data entry and retrieval, data sorting, creation of files, daily updating of data files, and data and file transfers. Also responsible for daily microcomputer maintenance and troubleshooting.

Hydroacoustic technician for a fisheries consulting firm involved in a downstream salmonid migration study at five dams on the Columbia River, Washington. Operated and monitored hydroacoustic systems in an effort to count downstream migrants as they passed through the dams. Interpreted and analyzed raw data for entry into computer files. Computer oriented tasks included creation of data files; retrieval, interpretation and sorting of data; and editing of files through the use of word processing skills.

PUBLICATIONS

"Carbonate Dissolution in the Western North Atlantic: Glacial/Interglacial Changes on the Muir and Siboney Seamounts." Co-author. Abstract published by The Geological Society of America. March, 1980.

ROBERT L. PESHKIN

EDUCATION

Southampton College of Long Island University, B.S., Geology/Marine Science (1980)

PROFESSIONAL EXPERIENCE

Project team leader for performance of preliminary assessments of 160 potential hazardous waste sites in Washington State according to Resource Conservation and Recovery Act (RCRA) Section 3012. The project teams are conducting records searches, site surveys, and interviews of owners/operators, and adjacent property owners for the purpose of identifying and summarizing the potential risks associated with past and current hazardous waste management practices. Directly responsible for assessment of pollutant and leachate mobilization and migration, and potential environmental and health risks. Teams are assigning numerical rating to all sites for data base profiling of hazardous waste site priority listing.

Field geologist responsible for oversight of well drilling subcontractors and the collection and field interpretations of soil samples and groundwater flow features during site investigations for hazardous waste monitoring activities in accordance with the USAF Installation Restoration Program (IRP) at McChord AFB, Washington, Kingsley Field, Oregon, and George AFB, California. Field project assignments have employed multiple drilling techniques and installation of monitoring, observation and recovery wells at depths in excess of 200 feet. Field investigations have also employed the use of seismic refraction and electrical resistivity geophysical techniques over 20,000 linear feet of ground surface to define both groundwater table elevations and stratigraphic interfaces. Additional project experience includes a two million square foot magnetometer survey to locate buried drums, and exfiltration tests of perforated industrial drain pipelines. Geohydrologic analyses were performed using field and geophysical data to determine groundwater movement, contaminant fluxes and boundaries, and rates of contaminant migration.

Data analyst at Environmental Protection Agency, Region X, updating NPDES wastewater discharge permits. Responsible for interpreting and coding discharge permits for entry into the National Permit Compliance System (a computer tracking system for discharge compliance and monitoring information). Also assisted data processing center in solving problems in the data base.

Field geologist for a minerals exploration firm. Primary duties involved outlining surficial hydrocarbon deposits in northeastern Utah through field exploration and interpretation of cuttings and geophysical logs. Prepared stratigraphic cross sections, and isopach, lithofacies and geologic maps from data collected. Other responsibilities included supervision of drill crews on a uranium exploration project in eastern Washington. Performed field investigations of rock cores and correlated results with geophysical logs in an effort to determine trends of fracture patterns and mineralization for selection of drill sites.

Ms. O'Flaherty is a lead author of a report for EPA Region X in which she identified major water uses within designated subregions of Puget Sound which could be adversely impacted by poor water quality. Water quality dependent uses included commercial and recreational fisheries, aquaculture and recreation. In addition she proposed a ranking scheme of these uses in terms of relative importance within each subregion. This ranking is hoped to aid management decisions applicable within the subregions. This project required a massive data gathering effort with state, local, and Federal agencies to provide up-to-date information.

Ms. O'Flaherty was a lead field technician for the Phase IIb IRP programs at McChord AFB in Washington State and George AFB in California. Her project responsibilities included well siting and installation, well development in preparation for chemical sampling, and the collection and storage of sediment and water samples including volatile organics, phenols, cyanides, trace metals, and trace organics. She also assisted in the procurement of equipment and supplies and prepared field summary reports of drilling and sampling activities. In addition, she performed routine collections of well data including: water table depths, pH, conductivity, and temperature.

Ms. O'Flaherty served as a research biologist for a 12-month wildlife monitoring project evaluating oil and gas exploration impacts in Eastern Washington. This project included extensive field investigations of upland game birds, non-game birds, and select big game species to determine potential changes in use patterns or distribution in the project area. She also participated in the development of an oil spill countermeasures manual concerned with the Alaskan Beaufort Sea. She was responsible for the graphic design of over 80 maps and charts detailing biological, socio-cultural, and geomorphological data.

PUBLICATIONS

Alaskan Beaufort Sea Coastal Region Volume 1: Oil Spill Response Considerations Manual, A report prepared for Alaska Clean Seas by B.J. Morson, P.M. O'Flaherty, D.J. Maiero, and R.W. Greiling, by JRB Associates, 1982.

Alaskan Beaufort Sea Coastal Region Volume 2: Biological Resources Atlas. A report prepared for Alaska Clean Seas by B.J. Morson and P.M. O'Flaherty, by JRB Associates, 1983.

Distribution of Big Game and Birds in Relation to Drill Rig and Access Road, Whiskey Dick Mountain, Kittitas County, Washington. A report prepared for Shell Oil Company by B.J. Morson and P.M. O'Flaherty, by JRB Associates, 1982.

Development of Effluent Limitations for Fish Hatcheries. A report prepared for U.S. EPA Region X by P.M. O'Flaherty, B.J. Morson, and R.W. Greiling, by JRB Associates, 1983.

Water Quality Dependent Water Uses in Puget Sound. A final report prepared for U.S. EPA Region X by P.M. O'Flaherty, D.P. Weston and B.J. Morson, by JRB Associates, 1984.

PATRICIA M. O'FLAHERTY

EDUCATION

University of Michigan: B.S., Natural Resources - Wildlife (1974)
Kent State University, Ohio: B.S., Biology - Natural Resources (1975)
University of Washington: 12 hours towards M.S., School of Forest Resources

PROFESSIONAL EXPERIENCE

Ms. O'Flaherty is a wildlife biologist with primary experience in areas of water quality monitoring and impacts assessments, hazardous wastes, and fisheries and avian biology.

Currently, Ms. O'Flaherty is a Task Leader of a preliminary assessment team conducting assessments of 160 Washington State hazardous waste storage or disposal sites in accordance with Section 3012 of the Resource Conservation and Recovery Act (RCRA). The preliminary assessment teams assemble and summarize all data relevant to each site as well as perform any site inspections needed to support such data. Factors including ground and surface water characteristics, the nature and quantities of waste material, condition and containment of these materials, potential or real impacts posed by the facility, and an assessment of the magnitude of such impacts are summarized and ranked using the Hazardous Ranking System (HRS) for each site. Ms. O'Flaherty is responsible for determining the completeness of each site she reviews as well as conducting any required field reconnaissance necessary to supplement existing file data. She provides all summarization of site materials and is responsible for the draft and final report segments relevant to these sites.

Ms. O'Flaherty is a Team Leader for IRP Phase I Records Search and Site Investigation at Shemya AFB Alaska. The project entails records search of sites on the installation and at appropriate Federal and State offices, interviews of key personnel, and field reconnaissance of the installation of all hazardous waste disposal practices, storage locations, and transfer sites. Shemya AFB site survey included intensive examination of the POL system, landfill and prior dump sites, and base shops and power plant site.

She recently completed a water quality monitoring program at several trout hatcheries located in Idaho for EPA Region X. The project is a two-phased study; the first, completed last year, investigated discharges from as many as nine hatcheries in order to provide EPA with data to develop effluent discharge limitations. This was accomplished by a six week field investigation in which she participated collecting water samples for laboratory analyses and conducting in-stream surveys. Following the field study she used results from the JRB study, an industry sponsored study, and historical or relevant literature on fish culturing in order to develop the effluent criteria. Ms. O'Flaherty designed the second phase of this project which is a field examination of instream screening devices to determine their effectiveness in attaining the recommended effluent limits. Ms. O'Flaherty supervised the field staff and hatcheries participating in this phase.

Project Manager from the IRP Phase I Records Search at Shemya AFB Alaska and the Principal Investigator for the field confirmation and reparation of Phase IIa Presurvey Reports for Clear AFS, Alaska and McChord AFB, Washington. The projects included site survey of all hazardous waste disposal practices; examination of the storage, transfer, use, and disposal of aviation fuels, solvents, lubricants, and other petroleum products; and a technical project work assignment and cost estimate to conduct intensive site investigations.

Analyzed 30 years of precipitation data to generate storm frequencies and rainfall intensities to develop design criteria for run-off control measures at a state-owned, contractor-operated secure hazardous waste landfill in accordance with RCRA regulation 264.301.

Served as Project Manager in a feasibility analysis and impact assessment for long-term disposal strategies for hazardous wastes in the State of Alaska. The study includes integrating treatment, storage and disposal (TSD) information from RCRA permit applicants, and small generator data from an industrial inventory and survey with historical data on abandoned waste disposal sites across the state. Socio-economic and legal considerations, as well as site location and design criteria, are being prepared.

PROFESSIONAL AFFILIATIONS

American Water Resources Association
American Water Works Association
Pacific Northwest Pollution Control Association
Water Pollution Control Federation

PUBLICATIONS

Evaluation of Collection, Treatment and Disposal Alternatives for Hazardous Wastes for the State of Alaska. A report prepared for the Alaska Dept. of Environmental Conservation, Juneau, Alaska, by JRB Associates under subcontract to Resource Technology Corporation, 1982.

Analysis of Precipitation and Development of Hydrologic Responses at the Arlington, Oregon Pollution Control Center. A report prepared for Chem-Securities Systems, Inc., under subcontract to Hart-Crowser Associates, by JRB Associates, 1983.

Geohydrologic Evaluations and Chemical Investigations for McChord AFB Washington. A report prepared for the USAF Occupational and Environmental Health Laboratory for Phase II of the IRP project, Brooks AFB, Texas. R.W. Greiling and S.P. Pavlou, by JRB Associates, 1983.

Implementation of RCRA Section 3012 at 160 Hazardous Waste Sites in Washington State, an invited paper for the Hazardous Materials Control Research Institute Fifth Annual Conference, November 9, 1984, Washington D.C. P.M. O'Flaherty, R.W. Greiling, and B.J. Morson.

Industrial Engineering Branch

Management Analyst*, DEI	5 years

Operations and Maintenance Branch

Equipment Foreman*, DEMPE	16 years
Equipment Operator*, DEMPE	18.5 years
Water and Waste Supervisor, DEMMW	1 year
Wastewater Treatment Plant Superintendent*, DEMMWS	16 years
Wastewater Treatment Plant Operator*, DEMMWS	11 years
Entomology Specialist, DEMMWS	5 years
Entomology Specialist*, DEMMWS	21 years
Liquid Fuels Maintenance NCOIC, DEMML	2 years
Liquid Fuels Maintenance Technician*, DEMML	12 years
Power Production Technician, DEMEP	1 year
Paint Shop Foreman*, DEMSS	22 years

TENANT UNITS

DPDO/LEWIS OFF-SITE BRANCH SPOKANE

Chief DPDO*	12 years

DET 24-40TH AEROSPACE RESCUE AND RECOVERY SQADRON (ARRS)

Deputy Commander Maintenance	6 years

DET 1, 1000TH SATELLITE OPS GROUP

Chief Maintenance	10 years

WASHINGTON AIR NATIONAL GUARD

141st Resources Management Sqadron

Assistant Chief Base Supply and USPNFO, LGS	8 months
Storage and Distribution Technician LGSD	7 years
Vehicle Maintenance and Operations Sup., LGTM/LGTO	8 years
Vehicle Mechanic, LGTM	8 years

141st Consolidated ACFT Maintenance Squadron

Field Maintenance

Supervisor Electric Shop, MAF	8 years
Supervisor ACFT Pneudraulic--IFR, MAF	8 years
ACFT Wheel/Tire Mechanic, MAF	8 years

AGE

Supervisor AGE, MAF — 8 years

Fabrication

Corrosion Control Technician, MAF — 8 years

Propulsion

Supervisor Jet Engine Shop, MAF — 8 years

Avionics Maintenance

Supervisor Avionics, MAA — 8 years

141st Civil Engineering Flight

ANG Base Civil Engineer, DE — 3 years

3636TH COMBAT CREW TRAINING WING

Resource Management

NCOIC Engineering Services, RM	2 years
NCOIC Transportation, LGT	1 month
NCOIC Heavy Equipment, LGTM	2 years

RETIREES

Superintendent Pavements and Grounds	1942-73
Superintendent Electrical	1947-84
Flight Chief	1947-78
Utilities Superintendent	1948-70
Superintendent Field Maintenance	1952-84
Assistant Air Field Manager	1942-83
Chief of Construction Management	1950-82

APPENDIX D

SUPPLEMENTAL ENVIRONMENTAL INFORMATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES PROGRAM
4620 Overland Road, Room 209
Boise, Idaho 83705

RECEIVED
OCT 17 1984
JRB - Seattle

October 15, 1984

Patricia M. O'Flaherty
JRB Associates
13400-B Northup Way, Suite 38
Bellevue, Washington 98005

Re: FWS-1-4-85-SP-9

Dear Ms. O'Flaherty:

This responds to your letter of October 4, 1984, concerning the proposed Installation Restoration Program (IRP) in the vicinity of Fairchild Air Force Base in Spokane County, Washington. We have reviewed your project according to the requirements of the Endangered Species Act of 1973, as amended.

Our records indicate that no threatened or endangered species presently occur in your project area.

Sincerely yours,

James F. Gore
Assistant Field Supervisor

cc: FWS, AFA, Portland
WDG, Spokane

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU IN COOPERATION WITH
THE WASHINGTON STATE DEPARTMENT OF COMMERCE AND ECONOMIC DEVELOPMENT
CLIMATOGRAPHY OF THE UNITED STATES 20-45

LATITUDE 47° 37'N
LONGITUDE 117° 31'W
ELEV. (GROUND) 2357 ft.

CLIMATOLOGICAL SUMMARY

STATION SPOKANE, WASH.
Spokane International Airport

NORMALS, MEANS, AND EXTREMES

Month	Temp. Normal Daily maximum	Temp. Normal Daily minimum	Temp. Normal Monthly	Temp. Extremes Record highest	Year	Record lowest	Year	Normal degree days	Precip. Normal total	Maximum monthly	Year
(a)	(b)	(b)	(b)	15		15		(b)	(b)	15	
J	31.4	19.2	25.3	62	1953	-24	1950	1231	2.44	4.96	1959
F	37.4	22.5	30.0	61	1958	-12	1956	980	1.86	3.94	1961
M	47.0	29.1	38.1	71	1960	-3	1955	834	1.50	3.75	1960
A	58.6	35.9	47.3	84	[illegible]	21	1951	531	.91	3.08	1948
M	68.3	43.1	55.7	92	1958	24	1954	298	1.21	5.71	1948
J	75.5	49.3	61.4	96	1958+	35	1954	147	1.49	2.84	1950
J	83.6	55.4	69.5	102	1960+	39	1962	19	.38	1.29	1948
A	81.1	53.9	67.5	98	1958+	40	1962	34	.41	1.41	1956
S	72.7	47.0	59.9	96	1950	30	1958+	189	.75	2.05	1959
O	57.1	38.0	48.6	80	1958+	20	1949	508	1.57	4.05	1950
N	41.9	28.5	35.2	61	1953	-11	1955	894	2.24	4.64	1960
D	34.9	24.2	29.6	54	1957	-9	1951	1097	2.43	4.35	1951
Yr	57.5	37.2	47.3	102	Jul 1960	-24	Jan 1950	6762	17.19	5.71	May 1948

Month	Precip. Minimum monthly	Year	Maximum in 24 hrs	Year	Snow, Sleet Mean total	Maximum monthly	Year	Maximum in 24 hrs	Year	Rel. humidity 4 AM PST	10 AM PST	4 PM PST	10 PM PST	Wind Mean hourly speed
(a)	15		15		15	15		15		13	13	13	13	14
J	.30	1949	1.48	1954	20.2	56.9	1950	13.0	1950	84	81	79	84	7.9
F	1.07	1955	.96	1961	10.1	20.6	1959	8.0	1951	84	77	71	81	8.9
M	.45	1948	.91	1950	5.3	12.4	1951	5.1	1950	80	65	56	75	9.3
A	.08	1956	.89	1962+	.2	1.4	1957	1.4	1957	75	53	41	63	9.3
M	.59	1956	1.67	1948	T	.2	1950	.2	1950	77	51	41	64	8.3
J	.30	1960	1.52	1957	T	T	1954	T	1954	74	48	38	59	8.4
J	T	1960+	.79	1955						64	38	26	43	7.7
A	T	1955	1.09	1955						63	42	28	46	7.6
S	.06	1950	.92	1948						69	47	34	54	7.6
O	.11	1952	.98	1955	.6	6.1	1957	6.1	1957	82	67	55	74	7.5
N	.34	1956	1.41	1960	6.0	24.7	1955	6.6	1955	86	78	74	83	7.6
D	1.21	1959	1.60	1951	15.6	39.4	1951	12.1	1951	88	84	83	87	8.4
Yr	T	Jul 1960+	1.67	May 1948	58.0	56.9	Jan 1950	13.0	Jan 1950	77	61	52	68	8.2

Month	Wind Prevailing direction	Fastest mile Speed	Direction	Year	Pct. of poss. sunshine	Average sky cover sunrise to sunset	Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Sleet 1.0 inch or more	Thunderstorms	Heavy fog	Max temp 90° and above	Max temp 32° and below	Min temp 32° and below	Min temp 0° and below
(a)	13	15	15		14	14	14	14	14	14	14	14	14	15	15	15	15
J	NE	56	SW	1951	26	8.1	4	4	25	16	6	0	9	0	17	28	5
F	SSW	54	SW	1949	36	8.1	3	5	20	13	4	0	6	0	6	25	1
M	SSW	54	SW	1955	52	7.5	4	8	19	12	2	*	3	0	2	24	*
A	SSW	56	SW	1962	62	7.0	5	8	17	8	*	1	1	0	0	10	0
M	SSW	49	W	1957	62	6.6	6	10	15	10	0	1	1	*	0	1	0
J	SSW	39	SW	1949	67	6.0	7	11	12	8	0	3	1	1	0	0	0
J	SW	37	W	1959	82	3.2	19	8	4	4	0	2	*	9	0	0	0
A	SW	38	SW	1950	78	4.2	16	8	7	5	0	2	*	5	0	0	0
S	NE	38	SW	1961+	71	4.9	12	9	9	6	0	1	*	1	0	1	0
O	SSW	56	SW	1950	51	6.6	7	8	16	9	*	*	5	0	0	7	0
N	NE	54	SW	1949	33	7.6	4	6	20	12	2	*	8	0	3	20	*
D	NE	51	SW	1956	22	8.6	2	4	25	16	5	0	12	0	12	27	1
Yr	SSW	56	SW	Oct 1950	57	6.5	89	89	187	118	19	11	46	16	39	142	7

(a) Length of record, years.
(b) Normal values are based on the period 1931-60 and are means adjusted to represent observations taken at the present standard location. Means and extremes in the above table are from the existing location. Annual extrmes have been exceeded at prior locations as follows: highest temperature 108 in July 1928, lowest temperature -30 in January 1888, maximum monthly precipitation 5.85 in November 1897, *minimum monthly precipitation* 0.00 in July 1883, maximum precipitation in 24 hours 2.22 in June 1888.

NARRATIVE CLIMATOLOGICAL SUMMARY

Spokane lies on the eastern edge of the broad Columbia Basin area of Washington which is bounded by the Cascade Range on the west and the Rocky Mountains on the east. *The elevations in eastern* Washington vary from less than 400 feet above sea level near Pasco where the Columbia River flows out of Washington to over 5000 feet in the mountain areas of the extreme eastern edge of the State. Spokane is located on the upper plateau area where the long gradual slope from the Columbia River meets the sharp rise of the Rocky Mountain Ranges.

Much of the urban area of Spokane lies along both sides of the Spokane River at an elevation of approximately 2000 feet, but the residential *areas have spread* to the crests of the plateaus on either side of the river with elevations up to 2500 feet above sea level. Spokane International Airport is situated on the plateau area six miles west-southwest and some 400 feet higher than the downtown business district.

Spokane's climate combines some of the characteristics of damp coastal type weather and arid interior conditions. Most of the air masses which reach Spokane are brought in by the prevailing westerly and southwesterly *circulations. Frequently* much of the moisture in the storms that move eastward and southeastward from the Gulf of Alaska and the eastern Pacific Ocean is precipitated out as the storms are lifted across the Coast and Cascade Ranges. Annual precipitation totals in the Spokane area are generally less than twenty inches and less than 50 percent of the amounts received west of the Cascades. *However, the precipitation and total cloudiness in the Spokane* vicinity is greater than that of the desert areas of south-central Washington. The lifting action on the air masses as they move up the east slope of the Columbia Basin frequently produces the cooling and condensation necessary for formation of clouds and precipitation.

Infrequently the Spokane area comes under the influence of dry continental air masses from the north or east. On occasions when these air masses penetrate into eastern Washington, the result is *high temperatures and very* low humidity in the summer and subzero temperatures in the winter. In the winter, most of the severe arctic outbursts of cold air move southward on the east side of the Continental Divide and do not affect Spokane.

In general, Spokane weather has the characteristics of a mild, arid *climate during the summer* months and a cold, coastal type in the winter. Approximately 70 percent of the total annual precipitation falls between the first of October and the end of March and about half of that *falls as snow. The growing* season usually extends over nearly six months from mid-April to mid-October. Irrigation is required for all crops except dryland type grains. The summer weather is ideal for full enjoyment of the many mountain and lake recreational areas in the immediate vicinity. Winter weather includes many cloudy or foggy days and below freezing temperatures with occasional snowfall of several inches *in depth.* Subzero temperatures and traffic-stopping snowfalls are infrequent. The nearby winter sports areas have a season of four to five months with plenty of facilities for skiing and other winter outdoor activities.

Earl L. Phillips
State Climatologist
U. S. Weather Bureau
Seattle, Washington
Revised [illegible]

Source: U.S. Dept. of Commerce. Undated. Climatological Summary for Spokane, Washington. Weather Bureau in coop. with Washington State Dept. of Commerce.

Average Temperature (°F)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann'l
1931	34.4	34.6	41.6	49.3	60.0	63.9	72.8	71.2	60.6	49.4	33.3	29.2	50.0
1932	26.1	29.7	38.2	50.0	55.7	66.4	69.1	69.6	61.2	49.2	42.0	26.9	48.7
1933	31.8	23.3	40.2	48.4	52.5	64.0	71.8	70.3	56.8	51.7	39.1	37.8	49.0
1934	37.4	39.4	47.2	56.5	61.2	65.4	71.3	71.0	57.6	51.4	43.6	32.9	52.9
1935	31.3	35.6	38.3	45.2	55.8	62.4	70.2	67.4	63.8	47.0	33.1	31.3	48.4
1936	31.8	17.4	38.7	52.2	62.0	65.5	72.8	71.0	59.1	52.2	32.3	33.0	49.0
1937	9.9	28.6	42.2	46.6	57.3	63.3	72.4	66.2	62.6	52.6	40.4	34.2	48.0
1938	31.5	33.6	41.1	49.8	56.8	66.8	75.0	67.8	67.8	51.2	35.1	32.8	50.8
1939	34.6	28.1	41.2	51.6	58.9	60.8	72.4	72.6	62.1	49.5	39.6	37.0	50.7
1940	30.0	35.9	45.3	50.6	66.5	68.3	72.8	70.6	64.6	53.0	32.2	33.9	51.5
1941	32.0	38.4	45.6	51.8	55.7	62.6	73.8	68.5	55.6	47.5	30.2	33.7	50.5
1942	22.6	31.9	39.6	49.8	53.0	59.6	71.2	70.4	61.9	50.4	35.0	32.4	48.1
1943	21.8	33.2	35.8	50.4	52.4	58.6	60.3	66.8	62.6	50.2	37.6	29.2	47.3
1944	30.2	32.5	37.0	47.9	56.8	62.6	60.7	66.8	61.6	54.2	36.8	28.4	48.7
1945	32.6	35.3	37.8	44.7	56.3	60.5	70.9	69.4	56.6	50.8	36.8	29.8	48.5
1946	30.9	35.2	41.1	48.0	57.0	60.5	69.4	68.6	58.8	44.2	34.6	32.6	48.4
1947	24.4	36.1	42.6	48.2	59.6	61.5	70.1	66.7	59.0	50.8	34.8	31.2	48.8
1948	27.5	29.0	36.2	43.5	52.8	65.4	65.1	65.2	58.1	47.3	34.8	21.5	45.5
1949	8.5	26.4	38.0	49.2	59.1	61.8	68.6	68.6	61.6	44.2	41.2	27.8	46.2
1950	9.0	29.8	35.7	43.9	52.2	61.0	69.1	70.2	62.0	46.7	36.2	33.6	45.8
1951	27.1	32.2	34.3	48.3	54.5	61.3	71.0	63.3	60.2	45.7	35.7	22.2	46.8
1952	23.5	30.2	36.7	49.8	56.5	61.0	70.1	68.4	63.8	54.5	32.7	30.3	48.1
1953	37.9	35.1	40.0	45.6	52.4	57.2	69.3	68.0	61.7	51.6	40.3	33.2	49.4
1954	26.9	33.1	36.3	43.5	55.4	57.2	67.5	64.5	57.5	46.2	41.5	30.2	46.6
1955	26.9	27.9	31.2	40.6	49.4	62.7	66.4	68.4	59.4	47.1	28.1	26.8	44.6
1956	28.9	22.6	36.1	49.9	58.1	58.9	71.6	67.6	60.7	46.3	32.7	30.7	47.0
1957	15.0	28.7	37.6	48.0	59.3	62.1	67.5	65.6	62.8	45.0	35.6	35.1	46.9
1958	32.0	39.8	38.9	44.9	62.7	65.6	73.0	73.7	58.7	50.2	35.7	32.4	50.7
1959	29.0	30.5	39.2	47.4	50.6	61.7	70.6	64.4	55.1	46.1	31.5	28.8	46.3
1960	20.5	30.6	38.2	45.9	51.2	62.2	75.1	65.1	60.3	48.6	35.2	26.6	46.6
1961	30.1	37.0	39.9	45.1	53.0	66.6	71.9	74.0	55.9	45.2	30.7	26.6	48.0
1962	22.6	32.4	34.6	49.8	50.9	61.1	68.2	65.4	60.7	47.6	37.9	33.1	47.0

Total Precipitation (Inches)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann'l
1931	1.50	.76	1.52	.53	.26	.87	T	.01	1.05	.82	2.41	3.88	13.61
1932	1.99	.82	2.69	.93	2.74	.28	.21	.27	.06	1.14	2.59	2.13	15.85
1933	1.16	.60	1.19	.28	.59	1.16	.17	.64	1.25	2.72	.80	4.35	14.91
1934	2.57	.27	1.53	.34	.25	.84	T	.19	.98	3.45	2.01	1.50	13.93
1935	2.06	.59	.78	.92	.06	.77	.68	.96	.05	.96	.90	1.78	10.51
1936	2.78	1.57	.58	.18	.57	2.33	.07	.23	1.64	.28	.08	2.39	12.70
1937	1.94	1.49	1.11	2.53	.23	3.13	.56	.61	.62	.87	3.05	2.76	18.90
1938	1.44	1.90	2.09	.35	.47	.83	.26	.29	.09	.83	.89	1.63	11.07
1939	1.55	2.37	1.20	.61	.30	.71	.40	.04	.23	.95	.28	2.83	11.47
1940	1.09	5.62	2.91	1.86	.64	.36	1.46	.01	2.12	2.47	2.37	2.59	23.50
1941	1.61	.83	.69	.32	3.18	2.55	.09	1.85	1.36	.85	1.63	2.78	17.74
1942	1.24	1.30	.48	.98	3.19	.93	.34	.08	.22	1.12	2.69	1.70	14.27
1943	1.25	1.15	1.60	1.33	1.19	1.42	.35	.98	.12	3.13	.60	.54	13.66
1944	.53	1.08	.57	1.40	.94	1.11	.21	1.02	.56	.45	1.64	1.14	10.65
1945	1.27	.95	2.46	1.12	2.20	1.37	T	.55	2.24	.79	2.41	2.00	17.36
1946	1.51	1.43	1.69	.98	1.43	1.08	.03	.07	1.76	1.38	3.16	.90	15.42
1947	1.24	.26	1.60	1.17	.31	1.98	.72	.83	1.57	5.41	1.67	1.80	18.56
1948	2.72	2.75	.45	3.08	5.71	2.17	1.29	.27	1.46	.66	2.38	3.13	26.07
1949	.50	3.08	2.17	.42	.90	.22	.07	.19	1.06	1.52	2.29	1.50	13.91
1950	4.13	1.93	3.75	.43	.72	2.84	.56	.41	.06	4.05	1.96	2.16	23.00
1951	3.16	1.61	1.72	.38	.66	1.04	.37	.40	.47	3.26	1.88	4.35	19.30
1952	2.41	1.33	1.14	.28	.63	2.44	.06	.18	.52	.11	.80	3.10	13.00
1953	4.56	1.07	1.77	1.48	1.59	.81	T	1.36	.50	.19	2.00	1.90	17.23
1954	4.90	1.19	.83	.53	.78	.75	.85	1.25	1.55	.77	1.42	1.44	16.26
1955	1.38	1.32	.79	1.83	.67	.80	1.28	T	1.13	2.84	3.92	3.82	19.78
1956	2.87	1.44	1.29	.08	.59	1.18	.50	1.41	.09	1.87	.34	1.22	12.88
1957	1.34	1.54	1.82	.81	3.74	2.74	.04	.30	.68	2.33	.82	1.93	18.09
1958	3.55	3.27	.84	1.72	.71	1.63	1.15	.13	.47	.79	3.72	2.93	20.91
1959	4.96	2.01	1.21	.57	2.26	.39	.05	1.24	2.05	1.32	2.30	1.21	19.57
1960	1.05	1.64	2.36	1.51	2.73	.16	T	.56	.72	.95	4.64	1.37	17.69
1961	1.61	3.94	1.75	.96	1.77	1.64	.37	.30	.17	1.05	1.83	3.91	19.30
1962	1.39	1.72	2.56	1.02	1.65	.78	.29	.63	.90	1.62	3.02	1.44	17.02

PROBABILITY OF 32°, 28°, 24°, 20° AND 16° OCCURRING AS LATE IN THE SPRING OR AS EARLY IN THE FALL AS THE DATES LISTED IN THE FOLLOWING TABLE:

	PROBABILITY - SPRING				PROBABILITY - FALL			
	75%	50%	25%	10%	10%	25%	50%	75%
32°	Apr 7	Apr 20	May 3	May 15	Sep 19	Sep 30	Oct 12	Oct 24
28°	Mar 24	Apr 6	Apr 19	May 1	Oct 3	Oct 14	Oct 26	Nov 7
24°	Feb 28	Mar 14	Mar 27	Apr 8	Oct 18	Oct 29	Nov 10	Nov 22
20°	Feb 7	Feb 21	Mar 7	Mar 19	Oct 31	Nov 11	Nov 23	Dec 6
16°	Jan 26	Feb 11	Feb 26	Mar 10	Nov 13	Nov 24	Dec 8	Dec 26

In the above table, the 50% point is the same as the average for each freeze category.

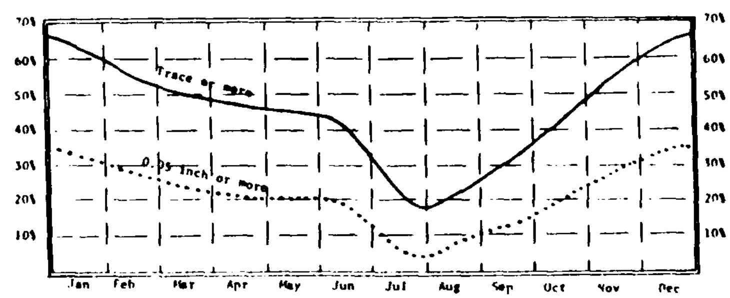
From a statistical viewpoint based on past data, the probabilities could be considered as follows when converted into the number of occurrences to expect in a 40-year period:

75% - 30 years in 40   25% - 10 years in 40

50% - 20 years in 40   10% - 4 years in 40

(More detailed local monthly and annual climatological data summaries are available from the U.S. Weather Bureau Office, Spokane, Wash.)

PROBABILITY OF PRECIPITATION OCCURRING ON ANY GIVEN DAY AT SPOKANE
(Based on 77 years of data ending with 1957)

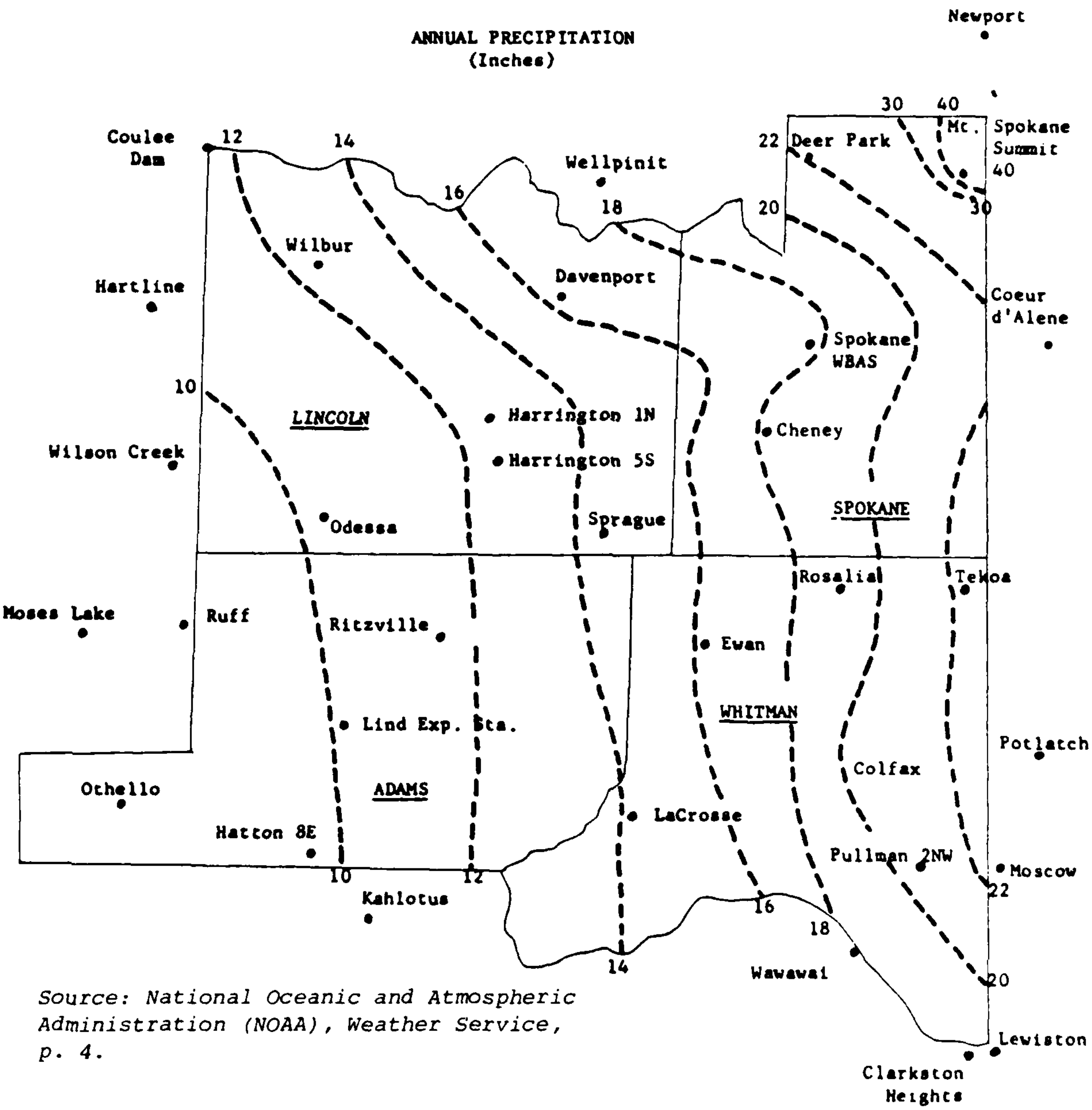


Note: The probability of a trace or more of precipitation occurring on any day is indicated by the solid line. The probability of 0.05 of an inch is indicated by the dotted line.

Source: U.S. Dept. of Commerce. Undated. Climatological Summary for Spokane, Washington. Weather Bureau in coop. with Washington State Dept. of Commerce.

The variability of monthly and annual precipitation is given in Table 11. Here, specific amounts corresponding with selected frequencies are given. For example, at Lind Experiment Station, the total precipitation for July is only a trace in 1 summer out of 10; also, it exceeds 0.6 of an inch in 1 summer out of 10. Annual precipitation is less than 6 inches in 1 year out of 10; also, it is more than 12 inches in 1 year out of 10.

ANNUAL PRECIPITATION
(Inches)



Source: National Oceanic and Atmospheric Administration (NOAA), Weather Service, p. 4.

POTABLE WATER QUALITY

	Well 2	Well 5	Well 6	Well 7	Clear Lake	Det 1,1000
11 July 1984						
Arsenic	<10 μg/l					
Barium	<200 μg/l					
Cadmium	<10 μg/l	Same →				
Chromium						
Lead	<20 μg/l					
Mercury	<1 μg/l					
Nitrates (as N)	1.34 mg/l	1.1 mg/l	0.48 mg/l	1.9 mg/l	<0.1 mg/l	<0.1 mg/l
Selenium	Awaiting Results →					
Silver	<10 μg/l					
Endrin	N.D.					
Lindane	N.D.					
Methoxychlor	N.D.	Same →				
Toxaphene	N.D.					
2,4-D	N.D.					
2,4,5-TP Silvex	N.D.					
Trihalomethanes (TTHM)	Awaiting Results →					
Trihalomethanes (MTP)	Awaiting Results →					
Sodium (15 May 1984)	12.8 mg/l					
Aldrin	N.D.	Same →				
Alpha,Beta & Delta BHC	N.D.					
27 August 1984						
Arsenic	<10				N.D.	N.D.
Barium	<1000				N.D.	N.D.
Cadmium	<10				N.D.	N.D.
Chromium	<50				N.D.	N.D.
Iron	<100	Same →			N.D.	N.D.
Lead	<50				N.D.	N.D.
Manganese	<50				N.D.	N.D.
Mercury	<2				N.D.	N.D.
Selenium	<10				N.D.	N.D.
Silver	<10				N.D.	N.D.
Gross α Part. Act.*						
11 Jan 1984	1 pci	<1 pci	<1 pci	2 pci	4 pci	<1 pci
11 Apr 1984	<1 pci	<1 pci	<1 pci	1 pci	3 pci	<1 pci
11 Jul 1984	<1 pci	<1 pci	<1 pci	<1 pci	1 pci	<1 pci

*Gross Alpha Particles Activity: monitoring requires the averaging of three independant samples collected over one year. Monitoring required every three years.

Source: USAF OEHL

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

	Present Location (Bldg #)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical On-Site T.S.D. Methods*
92nd BOMB WING HEAVY				
OPERATION				
Training Division				
Life Support	2036	Yes	No	
MAINTENANCE				
92nd Avionics Maintenance Squadron				
Navigational Aids	2120	No	No	
Radar Maintenance	2120	Yes	No	
Radio Shop	2120	Yes	No	
Autopilot	2120	Yes	No	
Instrument	2120	Yes	No	
Bomb/Nav	2120	Yes	No	
Fire Control	2120	Yes	Yes	DPDO
Photo Shop	2120	No	No	
PMEL	2135	Yes	Yes	DPDO
92nd Field Maintenance Squadron				
Aerospace Ground Equipment	2050	Yes	Yes	Burned at Deep Creek, recycled by contractor, DPDO, fire training
Egress	2050	No	No	
Electrical Systems	2050	Yes	Yes	Neutralize, sanitary sewer
Environmental Systems	2050	Yes	Yes	Fire training, burned at Deep Creek, DPDO
Fuels Systems	1012	Yes	No	
Pneudraulics	2050	Yes	Yes	Fire training, burned at Deep Creek, DPDO
Repair and Reclamation	2050	Yes	Yes	Fire training, burned at Deep Creek, DPDO
Corrosion Control	2050	Yes	Yes	Salvage/recycle, DPDO
Machine Shop	2050	Yes	Yes	Fire training, burned at Deep Creek, DPDO
Non-Destructive Inspection	2050	Yes	Yes	DPDO, recycled by contractor, fire training, burned at Deep Creek, sanitary sewer
Structural Repair	2050	Yes	No	
Survival Equipment	2050	Yes	No	
Welding Shop	2050	Yes	Yes	DPDO
Engine Shop (Test Cell)	2163	Yes	Yes	Separator to storm drain, DPDO, neutralize to storm drain, fire training, burned at Deep Creek
92nd Munitions Maintenance Squadron				
Conventional Maintenance	1458	Yes	No	
Weapons Maintenance	1410	Yes	No	
Equipment Maintenance	1419	Yes	Yes	Fire training, burned at Deep Creek, DPDO
SRAM Maintenance	1409	Yes	Yes	Fire training, burned at Deep Creek, DPDO
92nd Organizational Maintenance Squadron				
Bomber Branch	1017	Yes	Yes	Reuse by Support Branch, contractor recycle, DPDO
Inspection Branch	1021	Yes	Yes	Separator, sanitary sewer
Support Branch	1013	Yes	Yes	Separator, sanitary sewer, contractor recycle, DPDO
Tanker Branch	1017	Yes	Yes	Reuse by Support Branch, contractor recycle, DPDO
RESOURCE MANAGEMENT				
92nd Transportation Squadron				
Air Freight	2249A	No	No	
Packing & Crating	2249A	Yes	No	
Railroad	2385	Yes	No	
Vehicle Maintenance	2115	Yes	Yes	Neutralized, sanitary sewer, fire training, burned at Deep Creek, DPDO
Paint and Body Shop	2115	Yes	Yes	Neutralized, sanitary sewer
Refueling Maintenance	2115	Yes	Yes	Contractor recycle, DPDO

*Treatment, storage or disposal (TSD) is not applicable where no hazardous wastes are generated.

	Present Location (Bldg #)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical On-Site T.S.D. Methods*
USAF HOSPITAL				
Hospital Services				
Radiology Service/X-Ray	9000	Yes	Yes	Recover silver, sanitary sewer
Chemistry Lab	9000	Yes	Yes	Dilution to sanitary sewer
Surgical Services				
Surgical Suite	9000	Yes	No	
Medical Logistic Management				
Medical Maintenance	9000	Yes	No	
Physiological Training	2001B	Yes	Yes	Contractor recycle, DPDO
92ND COMBAT SUPPORT GROUP				
MORALE, WELFARE AND RECREATION DIVISION				
Hobby Shops				
Art and Craft	2185	Yes	No	
Automotive Hobby Shop	285	Yes	Yes	Contractor recycle, burn at Deep Creek
Wood Hobby Shop	2249C	Yes	No	
OPERATION AND TRAINING DIVISION				
Audio Visual Branch				
Base Photo Lab	2135	Yes	Yes	Sanitary Sewer
Graphics	2135	Yes	No	
Small Arms Training Branch				
Small Arms	2001D	Yes	Yes	Sanitary sewer
92ND CIVIL ENGINEERING SQUADRON				
Fire Prevention Branch				
Fire Department	3	Yes	Yes	Burned during fire training
Industrial Engineering Branch				
Industrial Engineering	2451B	No	No	
Operations and Maintenance Branch				
Entomology	2025/2096	Yes	No	
Exterior Electric	2451	Yes	Yes	DPDO
Interior Electric	2451	Yes	No	
Metal Shop	2451	Yes	No	
Paint Shop	2451	Yes	Yes	DPDO, landfill
Pavements and Grounds	2451	Yes	Yes	Storm sewer
Power Production	2451	Yes	Yes	Burned at Deep Creek, contractor recycle, sanitary sewer, DPDO
Refrigeration Shop	2451	No	No	
Sewage Treatment Plant	--	Yes	Yes	DPDO
Water Treatment Plant	2169/2164	Yes	No	
TENANT ORGANIZATIONS				
DET. 24-40TH AEROSPACE RESCUE AND RECOVERY SQUADRON				
ARRS Maintenance Shop	1005	Yes	Yes	Fire training, contractor recycle, burned at Deep Creek, DPDO
WASHINGTON AIR NATIONAL GUARD				
141st Resources Management Squadron				
Fuels Shop	1029	Yes	Yes	Recycled, fire training
Vehicle Maintenance and Operations	446	Yes	Yes	DPDO, neutralized to storm sewer, dumped onto ground, burned at Deep Creek

*Treatment, storage or disposal (TSD) is not applicable where no hazardous wastes are generated.

	Present Location (Bldg #)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical On-Site T.S.D. Methods*
141st Consolidated ACFT Maintenance Squadron				
Electric Shop	1034	Yes	Yes	Sanitary sewer
Environmental	1034	No	No	
Fuels Systems	1037	No	No	
Pneudraulics	1034	Yes	Yes	Burned at Deep Creek, DPDO, contractor recycle
Repair and Reclamation	1033	Yes	Yes	Burned at Deep Creek, DPDO
Wheel and Tire	1034	Yes	Yes	Burned at Deep Creek, DPDO
Aerospace Ground Equipment (AGE)	285	Yes	Yes	Neutralize, storm sewer, contractor recycle
Corrosion Control	1060	Yes	Yes	Storm drain, burned at Deep Creek, DPDO
Machine Shop	1034	Yes	No	
Survival Equipment	446	Yes	No	
Jet Engine Shop	2163	Yes	Yes	Burned at Deep Creek, DPDO
Avionics Maintenance	1034	Yes	No	
3636TH COMBAT CREW TRAINING WING				
Resource Management				
Vehicle Maintenance	1212	Yes	Yes	Contractor recycle, DPDO

*Treatment, storage or disposal (TSD) is not applicable where no hazardous wastes are generated.

APPENDIX F

MASTER LIST OF POL AND FUEL STORAGE FACILITIES

APPENDIX F

MASTER LIST OF POL AND CHEMICAL STORAGE FACILITIES

POL STORAGE FACILITIES

Material Stored	Facility No.	Capacity	Location
JP-4	159	50,000 (5)	Underground
	159	25,000	Underground
	1001	25,000	Underground
	1011	25,000	Underground
	2035	50,000 (10)	Underground
	2050	1,000	Underground
	2400	840,000	Aboveground
	2405	840,000	Aboveground
	2406	210,000	Aboveground
	2410	1,260,000	Aboveground
	3000	2,500 (2)	Underground
	Yellow Stone	25,000 (2)	Aboveground
	Cusick	10,000	Underground
JP-9/10	1409	7,000 (3)	Underground
	1409	2,000	Underground
MOGAS	446	4,000	Underground
	1212	3,000 (2)	Underground
	2050	1,000	Underground
	2094	3,000	Underground
	2325	10,000 (2)	Underground
	2386	10,000 (2)	Underground
	Clear Lake	1,000	Underground
	Cusick	2,000	Underground
Diesel	446	1,000	Underground
	2050	1,000	Underground
	2094	4,000	Underground
	2325	10,000	Underground
	2478	5,000 (2)	Underground
	Site 07	550	Aboveground
	Mica Peak	20,000 (3)	Underground
	Cusick	2,650	Aboveground
	Geiger Field	8,000 (3)	Underground
FS-2 (Heating Oil)	445	7,000	Underground
	1200	1,000	Underground
	1207	2,500	Underground
	1212	3,000	Underground
	1224	1,050	Underground
	1228	2,000	Underground
	1236	2,000	Underground

Figure I-2 (cont'd)

PATHWAYS

there is evidence of migration of hazardous contaminants, assign *maximum factor* subscore of 100 points for direct ·idence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect ·idence exists, proceed to B.

Subscore = ______________

ate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. elect the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
. SURFACE WATER MIGRATION				
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
SUBTOTAL				108
Subscore (100 x factor score subtotal/maximum score subtotal)				
. FLOODING		1		3
Subscore (100 x factor score/3)				
. GROUNDWATER MIGRATION				
Depth to groundwater		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to groundwater		8		24
SUBTOTAL				114
Subscore (100 x factor score subtotal/maximum score subtotal)				

lighest pathway subscore

:nter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = ______________

WASTE MANAGEMENT PRACTICES

\verage the three subscores for receptors, waste characteristics, and pathways.

Receptors ______________

Waste Characteristics ______________

Pathways ______________

TOTAL ______________ Divided by 3 = Gross Total Score ______________

\pply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

______________ x ______________ = [ ]

Figure I-2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

of Site: ______

tion: ______

of Operation or Occurrence: ______

er/Operator: ______

nents/Description: ______

Rated By: ______

RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Population within 1,000 feet of site		4		12
Distance to nearest well		10		30
Land use/zoning within 1 mile radius		3		9
Distance to reservation boundary		6		18
Critical environments within 1 mile radius of site		10		30
Water quality of nearest surface water body		6		18
Groundwater use of uppermost aquifer		9		27
Population served by surface water supply within 3 miles downstream of site		6		18
Population served by groundwater supply within 3 miles of site		6		18
SUBTOTAL				180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				

WASTE CHARACTERISTICS

Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard Rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

______ x ______ = ______

Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

______ x ______ = ______

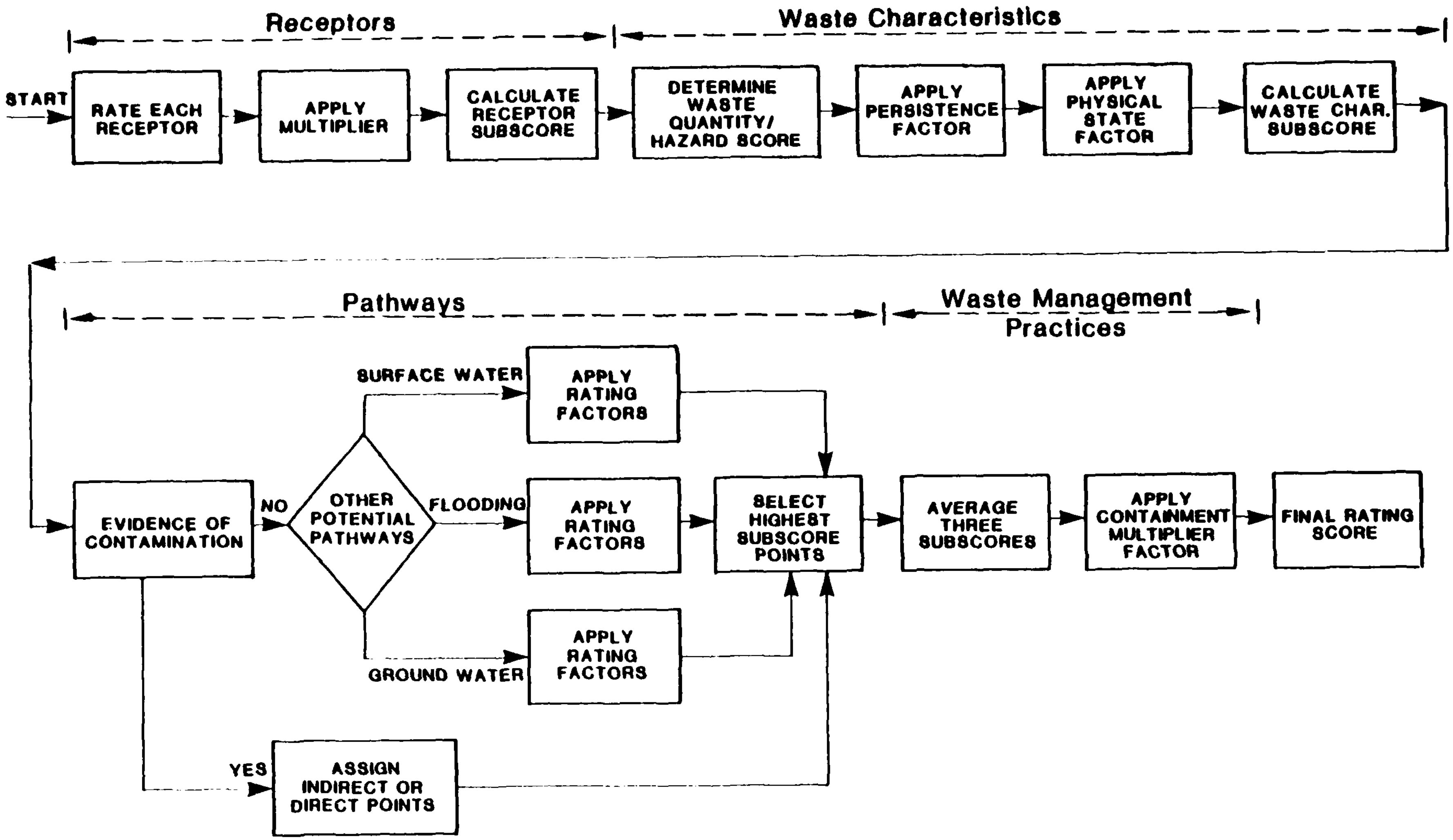


Figure I-1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART
(from USAF)

evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and goundwater migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. At this point the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by five percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

firmation work under Phase II of IRP.

This rating approach (see Figure I.1) is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring form to rank sites for priority attention (see Figure I.2). However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data obtained during the record search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) the possible receptors of the contamination; (2) the waste and its characteristics; (3) potential pathways for waste contaminant migration; and, (4) any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating (see Table I.1).

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence 80 points are assigned and for direct evidence 100 points are assigned. If no

APPENDIX I

HAZARD ASSESSMENT RATING METHODOLOGY (HARM)

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the records search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from the USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for six months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF/OEHL, AFESC, various major commands, Engineering Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and con-

APPENDIX I

HAZARD ASSESSMENT RATING METHODOLOGY (HARM)

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APPENDIX H

REFERENCES

PHOTO A (left)

Site PS-1, POL Bulk Storage Tanks
HARM Ranking: 53

PHOTO B (below)

Site SW-8, Base Landfill
at Craig Road
HARM Ranking: 63

APPENDIX G

PHOTOGRAPHS

FUEL TRANSFER AREAS

Material	Site Description	Facility Number	Capacity
JP-4	Truck Fillstand	N/A	500 gpm
	Truck Fillstand	N/A	600 gpm
	AGE Service	2050	12 gpm
	Jet Engine Test	3000	140 gpm
	7 pits-14 outlets	Area A	600 gpm
	5 pits-5 outlets	Area C	600 gpm
	14 Refuel Vehicle	N/A	5,000 gal
MOGAS	Truck Fillstand	N/A	100 gpm
	Auto Maintenance	1212	6 gpm
	AGE Service	2050	12 gpm
	Storage	2094	12 gpm
	Mil Service Station	2325	6 gpm
	BX Service Station	2386	6 gpm
	Guard Motor Pool	446	6 gpm
	2-Refuel Vehicle	N/A	1,200 gal
Diesel	Truck Fillstand	N/A	100 gpm
	AGE Service	2050	12 gpm
	Storage	2094	12 gpm
	Mil Service Station	2325	6 gpm
	CE Service	2478	6 gpm
	Guard Motor Pool	446	6 gpm
	1-Refuel Vehicle	N/A	1,200 gal
FS-2	NCO Housing Oil	70870	100 gpm
Deicing Fluid	Truck Fillstand	N/A	500 gpm

Material Stored	Facility No.	Capacity	Location
FS-2 (Heating Oil)	1238	2,000	Underground
	1302	550	Underground
	1314	15,550	Underground
	1350	500	Underground
	1402	550	Underground
	1405	1,050	Underground
	1406	1,550	Underground
	1407	1,550	Underground
	1409	6,000	Underground
	1410	2,000	Underground
	1413	10,000 (2)	Underground
	1419	2,000	Underground
	1458	1,550	Underground
	1462	2,000	Underground
	1710	550	Underground
	2005	300	Underground
	2080	2,000	Underground
	2080	500	Underground
	2096	500	Underground
	2160	50,000 (2)	Underground
	2161	25,000 (2)	Underground
	2165	20,000 (2)	Underground
	2165	12,000 (5)	Underground
	2166	422,000	Underground
	2175	50,000	Underground
	2175	12,000	Underground
	2175	6,000	Underground
	2271	275	Underground
	5025	275	Underground
	70870	25,000	Aboveground
	Sewage Plant	500	Underground
	Officer Wherry	230 (343)	Aboveground
	Officer Wherry	275 (24)	Aboveground
	NCO Wherry	230 (342)	Aboveground
	NCO Wherry	275 (255)	Aboveground
	Cheney Housing	300 (16)	Underground
	Site 07	5,000	Underground
	Geiger Housing	300 (41)	Underground
	Geiger Heights	300 (131)	Underground
	Geiger Field	25,000 (16)	Underground
FS-5 (Heating Oil)	9005	10,000 (2)	Underground
	Geiger Field	6,000 (2)	Underground
FS-6 (Heating Oil)	1350	12,500 (2)	Underground

Table I-1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

Table I-1 (cont'd)

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- Verbal reports from interviewer (at least 2) or written information from the records.
- Knowledge of types and quantities of wastes generated by shops and other *areas on base*.
- Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- No verbal reports or conflicting verbal reports and no written information from the records.
- Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

Table I-1 (cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- Confirmed confidence levels (C) can be added
- Suspected confidence levels (S) can be added
- Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- Wastes with the same hazard rating can be added
- Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

Table I-1 (cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

Table I-1 (cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- Clay cap or other impermeable cover
- Leachate collection system
- Liners in good condition
- Adequate monitoring wells

Spills:

- Quick spill cleanup action taken
- Contaminated soil removed
- Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- Liners in good condition
- Sound dikes and adequate freeboard
- Adequate monitoring wells

Fire Proection Training Areas:

- Concrete surface and berms
- Oil/water separator for pretreatment of runoff
- Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX J

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: WW-1 Industrial Waste Lagoons

Location: On SE side of Base

Date of Operation or Occurrence: ∿ 1943

Owner/Operator: Fairchild AFB

Comments/Description: Sludge weathering and evaporation

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			79	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				43.9

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTAL			52	108
Subscore (100 x factor score subtotal/maximum score subtotal)				48.1
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to groundwater	0	8	0	24
SUBTOTAL			54	114
Subscore (100 x factor score subtotal/maximum score subtotal)				47.4

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	43.9
Waste Characteristics	100.0
Pathways	80.0
TOTAL	223.9

Divided by 3 = Gross Total Score: 74.6

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

74.6 x 0.95 = $\boxed{71}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FT-1 Fire Training Area

Location: East Side of Base, Eastern End of Taxiway #10

Date of Operation or Occurrence: 1969 to Present

Owner/Operator: Fairchild AFB

Comments/Description: Fire burn pit and oil/water separator

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			73	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				40.6

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

I. PATHWAYS

If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = 80

. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			46	108
Subscore (100 x factor score subtotal maximum score subtotal)				42.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	2	8	16	24
SUBTOTAL			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68.4

. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 80

V. WASTE MANAGEMENT PRACTICES

. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	40.6
Waste Characteristics	100.0
Pathways	80.0
TOTAL	220.6

Divided by 3 = Gross Total Score 73.5

. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

73.5 x 0.95 = 70

HAZARD ASSESSMENT RATING METHODOLOGY FORM

ne of Site: SW-1 Base Landfill NE of Taxiway 8

ation: West end of runway, northeast of Taxiway 8

:e of Operation or Occurrence: ≅ 1949 to 1958

ner/Operator: Fairchild AFB

nments/Description: ~10 acres

e Rated By: G. Steiner, Reviewed by R. Greiling

RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Population within 1,000 feet of site	1	4	4	12
Distance to nearest well	1	10	10	30
Land use/zoning within 1 mile radius	3	3	9	9
Distance to reservation boundary	3	6	18	18
Critical environments within 1 mile radius of site	0	10	0	30
Water quality of nearest surface water body	0	6	0	18
Groundwater use of uppermost aquifer	2	9	18	27
Population served by surface water supply within 3 miles downstream of site	0	6	0	18
Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			77	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				42.8

WASTE CHARACTERISTICS

Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

80 x 1.0 = 80

Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

PATHWAYS

If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = N/A

Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTAL			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				55.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to groundwater	3	8	24	24
SUBTOTAL			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68.4

Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 68.4

WASTE MANAGEMENT PRACTICES

Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	42.8		
Waste Characteristics	80.0		
Pathways	68.4		
TOTAL	191.2	Divided by 3 = Gross Total Score	63.7

Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

63.7 x 1.0 = 64

HAZARD ASSESSMENT RATING METHODOLOGY FORM

of Site: PS-3 Area C, Pumphouse Fueling

on: Near Building 159

of Operation or Occurrence: 1/22/74, 3/7/75, 12/2/76

/Operator: Fairchild AFB

ents/Description: Multiple JP-4 spills. Total spillage est. 760 gallons.

ated By: G. Steiner, Reviewed by R. Greiling

ECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
opulation within 1,000 feet of site	3	4	12	12
istance to nearest well	1	10	10	30
and use/zoning within 1 mile radius	3	3	9	9
istance to reservation boundary	2	6	12	18
ritical environments within 1 mile radius of site	0	10	0	30
ater quality of nearest surface water body	0	6	0	18
roundwater use of uppermost aquifer	2	9	18	27
opulation served by surface water supply ithin 3 miles downstream of site	0	6	6	18
opulation served by groundwater supply ithin 3 miles of site	3	6	18	18
UBTOTAL			85	180
eceptors subscore (100 x factor score subtotal/maximum score subtotal)				47.2

WASTE CHARACTERISTICS

elect the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

. Waste quantity (S = small, M = medium, L = large) S

. Confidence level (C = confirmed, S = suspected) C

. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

pply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

60 x 0.9 = 54

pply physical state multiplier

Subscore B x Physical State Multiplier - Waste Characteristics Subscore

54 x 1.0 = 54

ATHWAYS

ere is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct nce or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect nce exists, proceed to B.

Subscore = 80

the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. t the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				42.6
FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	3	8	24	24
Direct access to groundwater	3	8	24	24
SUBTOTAL			102	114
Subscore (100 x factor score subtotal maximum score subtotal)				89.5

est pathway subscore

r the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 89.5

ASTE MANAGEMENT PRACTICES

rage the three subscores for receptors, waste characteristics, and pathways.

Receptors	47.2		
Waste Characteristics	54.0		
Pathways	89.5		
TOTAL	190.7	Divided by 3 = Gross Total Score	63.6

ly factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

63.6 x 1.0 = 64

\THWAYS

re is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct ıce or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect ıce exists, pro ed to B.

Subscore = N/A

the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
URFACE WATER MIGRATION				
istance to nearest surface water	3	8	24	24
et precipitation	1	6	6	18
urface erosion	0	8	0	24
urface permeability	0	6	0	18
ainfall intensity	2	8	16	24
UBTOTAL			46	108
ubscore (100 x factor score subtotal/maximum score subtotal)				42.6
LOODING	0	1	0	3
ubscore (100 x factor score/3)				
ROUNDWATER MIGRATION				
epth to groundwater	3	8	24	24
let precipitation	1	6	6	18
oil permeability	3	8	24	24
ubsurface flows	1	8	8	24
irect access to groundwater	0	8	0	24
UBTOTAL			62	114
ubscore (100 x factor score subtotal/maximum score subtotal)				54.4

est pathway subscore

the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 54.4

ASTE MANAGEMENT PRACTICES

age the three subscores for receptors, waste characteristics, and pathways.

leceptors	39.4	
laste Characteristics	54.0	
athways	54.4	
OTAL	147.8	Divided by 3 = Gross Total Score: 49.3

y factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

49.3 x 0.95 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Site: IS-4 Jet Engine Test Cell

: NE End of Runway, South Side of Runway

Operation or Occurrence: ∿1976

Dperator: Fairchild AFB, FMS Propulsion Branch

ts/Description: Ongoing practice of dumping waste oil

ed By: G. Steiner, Reviewed by R. Greiling

:CEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
ulation within 1,000 feet of site	1	4	4	12
tance to nearest well	1	10	10	30
d use zoning within 1 mile radius	3	3	9	9
tance to reservation boundary	2	6	12	18
tical environments within 1 mile radius of site	0	10	0	30
er quality of nearest surface water body	0	6	0	18
undwater use of uppermost aquifer	2	9	18	27
ulation served by surface water supply hin 3 miles downstream of site	0	6	0	18
ulation served by groundwater supply hin 3 miles of site	3	6	18	18
3TOTAL			71	180
:eptors subscore (100 x factor score subtotal/maximum score subtotal)				39.4

ASTE CHARACTERISTICS

ect the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

Waste quantity (S = small, M = medium, L = large) S

Confidence level (C = confirmed, S = suspected) C

Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

ply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

60 x 0.9 = 54

ply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.0 = 54

PATHWAYS

f there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = N/A

Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35.2
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	3	8	24	24
SUBTOTAL			86	114
Subscore (100 x factor score subtotal/maximum score subtotal)				75.4

Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 75.4

WASTE MANAGEMENT PRACTICES

Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47.2
Waste Characteristics	40.0
Pathways	75.4
TOTAL	162.6

TOTAL 162.6 Divided by 3 = Gross Total Score: 54.2

Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

54.2 x 0.95 = 52

HAZARD ASSESSMENT RATING METHODOLOGY FORM

e of Site: IS-1 Building 1034, French Drain

ıtion: SW Corner of Base--North of Runway

e of Operation or Occurrence: 1978 to Present

ıer/Operator: Fairchild AFB/141st Washington Air National Guard

ıments/Description: Floor drains from all shops tied to gravel pack drain

Rated By: G. Steiner, Reviewed by R. Greiling

RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Population within 1,000 feet of site	3	4	12	12
Distance to nearest well	1	10	10	30
Land use/zoning within 1 mile radius	3	3	9	9
Distance to reservation boundary	3	6	18	18
Critical environments within 1 mile radius of site	0	10	0	30
Water quality of nearest surface water body	0	6	0	18
Groundwater use of uppermost aquifer	2	9	18	27
Population served by surface water supply within 3 miles downstream of site	0	6	0	18
Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			85	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				47.2

WASTE CHARACTERISTICS

Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) — S
2. Confidence level (C = confirmed, S = suspected) — C
3. Hazard Rating (H = high, M = medium, L = low) — M

Factor Subscore A (from 20 to 100 based on factor score matrix) — 50

Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

50 x 0.8 = 40

Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

I. PATHWAYS

If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = 80

Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50.0
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	0	8	0	24
SUBTOTAL			62	114
Subscore (100 x factor score subtotal/maximum score subtotal)				54.4

. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 80

V. WASTE MANAGEMENT PRACTICES

. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	42.8
Waste Characteristics	45.0
Pathways	80.0
TOTAL	167.8

Divided by 3 = Gross Total Score: 55.9

. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

55.9 x 0.95 = 53

HAZARD ASSESSMENT RATING METHODOLOGY FORM

lame of Site: PS-1 POL Bulk Storage Tanks

.ocation: NW Corner of Area 2400

late of Operation or Occurrence: 1957 to Present

lwner/Operator: Fairchild AFB

:omments/Description: Disposal and weathering of fuel sludge

ite Rated By: G. Steiner, Reviewed by R. Greiling

. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			77	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				42.8

I. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.75 = 45

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				42.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	3	8	24	24
SUBTOTAL			86	114
Subscore (100 x factor score subtotal/maximum score subtotal)				75.4

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	43.9
Waste Characteristics	54.0
Pathways	80.0
TOTAL	177.9

Divided by 3 = Gross Total Score 59.3

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

59.3 x 1.0 = 59

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: PS-2 Refueling Pits #18 and #19

Location: North of Ladder Taxiway No. 1, Between Bldgs. 1033 and 1029

Date of Operation or Occurrence: Spring 1984 (no. 8), June 1984 (no. 9)

Owner/Operator: Fairchild AFB

Comments/Description: JP-4 overflow at Pit 18, and GW contamination at Pit 19

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			79	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				43.9

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) — S
2. Confidence level (C = confirmed, S = suspected) — C
3. Hazard Rating (H = high, M = medium, L = low) — H

Factor Subscore A (from 20 to 100 based on factor score matrix) — 60

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

60 x 0.9 = 54

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.0 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTAL			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				55.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
3. GROUNDWATER MIGRATION				
Depth to groundwater	1	8	8	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	0	8	0	24
SUBTOTAL			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26.3

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 55.6

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62.8
Waste Characteristics	60
Pathways	55.6
TOTAL	178.4

Divided by 3 = Gross Total Score: 59.5

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

59.5 x 1.0 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: OB-1 OLAA 25 ADS Mica Peak Joint Surveillance Station

Location: Mica Peak

Date of Operation or Occurrence: In operation since 1959

Owner/Operator: FAA/AF Joint Operation

Comments/Description: Long range radar observation facility

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	2	6	12	18
I. Population served by groundwater supply within 3 miles of site	2	6	12	18
SUBTOTAL			113	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				62.8

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) — S
2. Confidence level (C = confirmed, S = suspected) — C
3. Hazard Rating (H = high, M = medium, L = low) — H

Factor Subscore A (from 20 to 100 based on factor score matrix) — 60

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				42.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
3. GROUNDWATER MIGRATION				
Depth to groundwater	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
SUBTOTAL			54	114
Subscore (100 x factor score subtotal/maximum score subtotal)				47.4

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 47.4

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	43.9
Waste Characteristics	100.0
Pathways	47.4
TOTAL	191.3

Divided by 3 = Gross Total Score 63.8

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

63.8 x 0.95 = 61

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: PS-4 Pumphouse B

Location: East of Base Operations, Approximately 250 feet

Date of Operation or Occurrence: 1957

Owner/Operator: Fairchild AFB

Comments/Description: Airplane crash into Pumphouse B causing spillage of several thousand gallons of AVGAS

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			79	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				43.9

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) — L
2. Confidence level (C = confirmed, S = suspected) — C
3. Hazard Rating (H = high, M = medium, L = low) — H

Factor Subscore A (from 20 to 100 based on factor score matrix) — 100

B Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTAL			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				55.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				
3. GROUNDWATER MIGRATION				
Depth to groundwater	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to groundwater	2	8	16	24
SUBTOTAL			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61.4

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 61.4

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	48.3
Waste Characteristics	80
Pathways	61.4
TOTAL	189.7

Divided by 3 = Gross Total Score: 63.2

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

63.2 x 1.0 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: SW-8 Base Landfill at Craig Road

Location: SE of Wastewater Treatment Plant

Date of Operation or Occurrence: ≅1957/58 to late 1970s

Owner/Operator: Fairchild AFB

Comments/Description: ∿26 acres

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			87	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				48.3

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: IS-3 Building 2150, Reciprocating Engine Test Cell

Location: NE of Building 2050

Date of Operation or Occurrence: Test cell 1942-1954; Storage Facility 1955-present

Owner/Operator: Fairchild AFB

Comments/Description: Fuels & solvents as test cell; chemical & waste storage; oils on floor

Site Rated By: G. Steiner, Reviewed by R. Greiling

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
SUBTOTAL			79	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				43.9

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard Rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore = N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. SURFACE WATER MIGRATION				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
SUBTOTAL			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				42.6
2. FLOODING	0	1	0	3
Subscore (100 x factor score/3)				0
3. GROUNDWATER MIGRATION				
Depth to groundwater	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to groundwater	0	8	0	24
SUBTOTAL			46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40.4

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3, above. Pathway Subscore = 42.6

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 43.9
Waste Characteristics 40.0
Pathways 42.6
TOTAL 126.5 Divided by 3 = Gross Total Score. 42.2

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

42.2 x 0.95 = 40

APPENDIX K

GLOSSARY OF TERMS

APPENDIX K

GLOSSARY OF TERMS

Aquifer: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

Basalt: A fine grained, sometimes glassy igneous rock. Basalts are commonly extrusive and are characterized by low silica content and higher iron and magnesium content.

Bedrock: A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

Bowser: A tank truck used for hauling liquids.

Confined Aquifer: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

Contamination: The degradation of soil chemistry or natural water quality to the extent that its usefulness is impaired. There is no implication of any specific limits to water quality since the degree of permissible contamination depends upon the intended end use or uses of the water.

Dike: A tabular igneous intrusion that cuts across the bedding planes or foliation of the country rock.

Disposal Facility: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at a location at which the waste will remain after closure.

Disposal of Hazardous Waste: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwater.

Downgradient: The direction in which groundwater flows, and more specifically in the direction of decreasing hydraulic static head.

Drawdown: The difference between static water level and pumping water level measured in a well at a given time. Drawdown varies with discharge and time.

Dump: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics. Dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

Effluent: A liquid waste discharged in its natural state from a manufacturing or treatment process. Such waste shall be partially or completely treated.

Eolian: Wind formed deposits such as loess and dune sand.

Erosion: The wearing away of land surface by water or chemical, wind or other physical processes.

Facility: Any land and appurtenances thereon which are used for the treatment, storage and/or disposal of hazardous wastes.

Fault: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

Flow Path: The direction or movement of groundwater as governed principally by the hydraulic gradient.

Groundwater: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

Hardstand: A hard-surfaced area for parking an airplane.

Hazardous Waste: A solid waste or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Hazardous Waste Generation: The act or process of producing a hazardous waste.

Infiltration: The movement of water through the soil surface into the ground.

Intrusive: Rock forming process where molten rock has been forced into cracks, fissures or voids prior to cooling and solidification.

Lava: The material extruded by a volcano which consists of molten or part-molten silicate material.

Leachate: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

Leaching: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

Liner: A continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

Loess: Accumulations of wind-borne dust. The dust is derived originally from desert area or from vegetation-free areas around ice sheets.

Monitoring Well: A well used to measure groundwater levels and to obtain samples.

Organic: Being, containing, or relating to carbon compounds, especially in which hydrogen is attached to carbon.

Perched Aquifer: Unconfined groundwater separated from an underlying main body of ground water by an unsaturated zone.

Percolation: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

Permeability: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

Pleistocene: The latest period of time in the stratigraphic column. An epoch of the Quaternary period which began 2-3 million years ago.

Pollutant: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

Pumping Water Level: The water level measured in a pumping well. See "Static Water Level" and "Drawdown".

Recharge: The addition of water to the groundwater system by natural or artificial processes.

Secondary Sewage Treatment: The use of biological organisms to reduce the dissolved organic matter in wastewater.

Sludge: Any inorganic or organic solids residues from a waste treatment plant, water supply treatment, or air pollution control facility; or other discarded material, including solid, liquid, semi-solid or solids which contain gaseous material resulting from industrial, commercial, mining or agricultural operations and community activities. Sludge does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

Specific Capacity: The yield of a well expressed as gallons per minute (gpm) pumped divided by feet of drawdown (gpm/ft).

Spill: Any unplanned release or discharge of a hazardous waste onto or into the air, land or water.

Static Water Level: The undisturbed water level measured in a well which represents the potentiometric surface for an aquifer. It is generally expressed as feet below (or above) an arbitrary measuring datum near land surface.

Storage of Hazardous Waste: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

Toxic: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

Treatment of Hazardous Waste: Any method, technique, or process in including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous.

Upgradient: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of groundwater.

Water Table: Surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

APPENDIX L

LIST OF ACRONYMS AND ABBREVIATIONS

APPENDIX L

LIST OF ACRONYMS AND ABBREVIATIONS

AF:	Air Force
AFB:	Air Force Base
AFESC:	Air Force Engineering and Services Center
AFFF:	Aqueous Film Forming Foam, a fire extinguishing agent
AFS:	Air Force Station
AGE:	Aerospace Ground Equipment
AMS:	Avionics Maintenance Squadron
AREFW:	Air Refueling Wing
ARRS:	Aerospace Rescue and Recovery Squadron
AVGAS:	Aviation Gasoline
BEE:	Bioenvironmental Engineer
BES:	Bioenvironmental Engineering Section
BOD:	Biochemical Oxygen Demand
BMW:	Bombardment Wing
CAA:	Civil Aeronautics Authority
CAM:	Consolidated Aircraft Maintenance
CE:	Civil Engineer or Civil Engineering
CERCLA:	Comprehensive Environmental Response, Compensation and Liability Act
CES:	Civil Engineering Squadron
COE:	(U.S. Army) Corps of Engineers
CSG:	Combat Support Group
DEQPPM 81-5	Defense Environmental Quality Program Policy Memorandum 81-5
DET:	Detachment
DMSP:	Defense Meteorological Satellite Program

DoD:	Department of Defense
DPDO:	Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.
EPA:	U.S. Environmental Protection Agency
FAA:	Federal Aviation Administration
FMS:	Field Maintenance Squadron
FTA:	Fire Training Area
FWPCA:	Federal Water Pollution Control Act
GC/MS:	Gas Chromatograph/Mass Spectrometer
gpm:	Gallons per minute
HARM:	Hazard Assessment Rating Methodology
HQ:	Headquarters
IRP:	Installation Restoration Program
JP-4:	Jet Propulsion Fuel Number Four
JRB:	JRB Associates, a Company of Science Applications International Corporation
JSS:	Joint Surveillance System
kts:	Knots; as wind speed is nautical mile per hour (equal to 1.15 mile/hr or 1.853 kilometer/hr)
KV:	Kilovolt
MAC:	Military Airlift Command
MAST:	Military Assistance to Safety and Traffic
MBAS:	Methylene Blue Active Substances
MGD:	Million gallons per day
MMS:	Munitions Maintenance Squadron
MOGAS:	Motor Vehicle Gasoline
MSL:	Mean Sea Level
NCO:	Non-commissioned Officer
NCOIC:	Non-commissioned Officer In-Charge

NPDES: National Pollutant Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

OIC: Officer in Charge

OMS: Organizational Maintenance Squadron

PCB: Polychlorinated Biphenyl; liquids used as dielectrics in electrical equipment

POL: Petroleum, Oils and Lubricants

PMEL: Precision Measurement and Equipment Laboratory

ppb: Parts per billion

ppm: Parts per million

PWL: Pumping Water Level

RCRA: Resource Conservation and Recovery Act

SAC: Strategic Air Command

SAX: Sax, N. Irving, Dangerous Properties of Industrial Materials, Sixth Edition (Van Nostrand Reinhold Co., New York, 1984)

SOP: Standard Operating Procedure

SP: Security Police

SWL: Static Water Level

TAC: Tactical Air Command

TOC: Total Organic Carbon

TOX: Total Organic Halogens

TSCA: Toxic Substance Control Act

TSD: Treatment Storage and Disposal

USAF: United States Air Force

TSS: Total Suspended Solids

USGS: United States Geological Survey

WANG: Washington Air National Guard

WDOE: Washington State Department of Ecology

WSA: Weapon Storage Area

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